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The Automobile

Vol. XXXIV, No. 11

NEW YORK, MARCH 16, 1916

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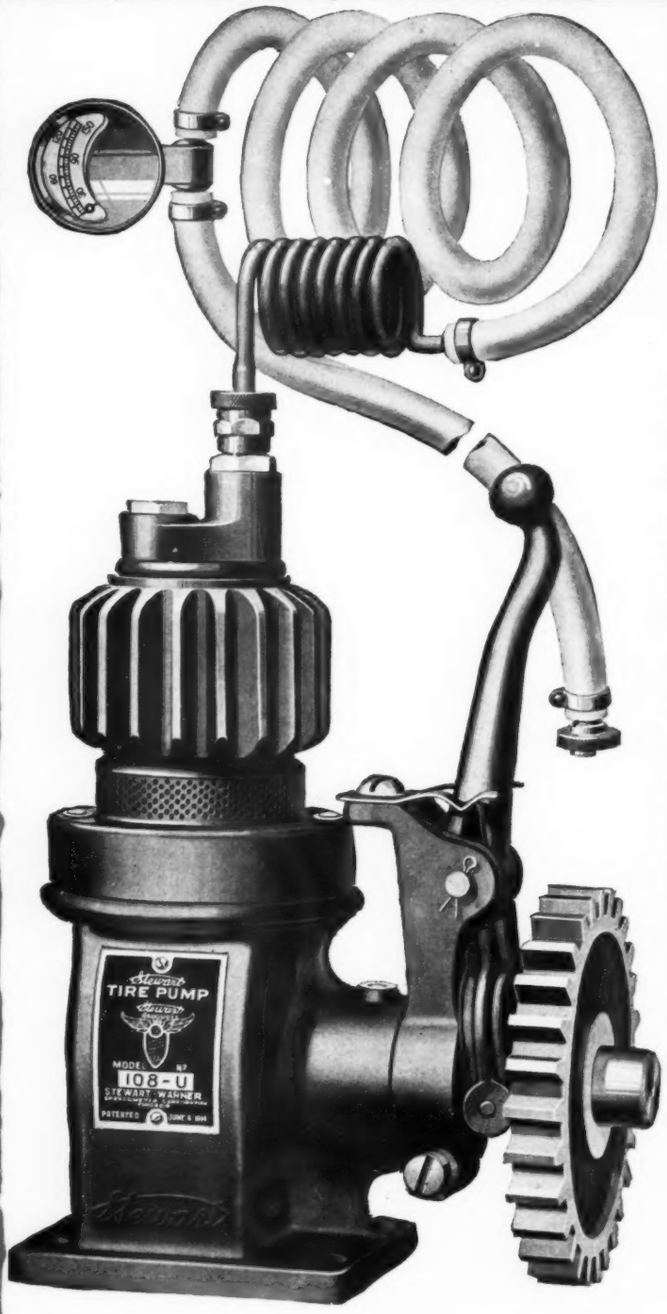

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VOL. XXXIV NEW YORK—THURSDAY, MARCH 16, 1916—CHICAGO No. 11

The AUTOMOBILE

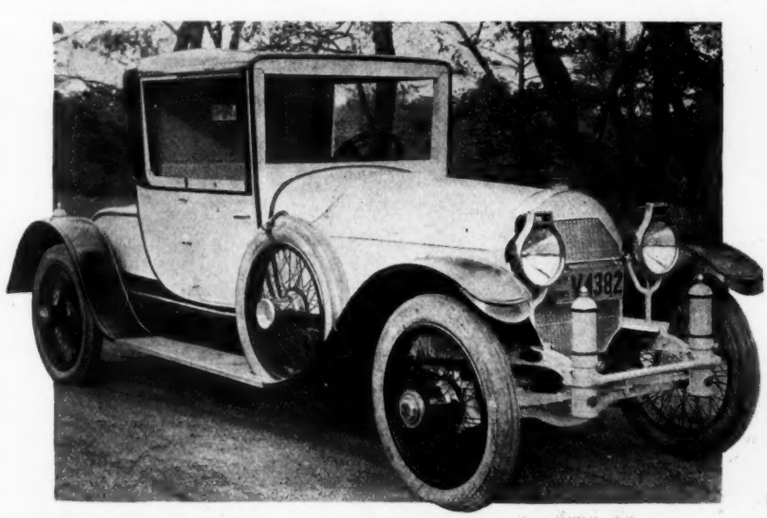
Custom-Built Bodies Grow in Popularity

This Branch of the Automobile Industry, Until Recently Comparatively Insignificant, Promises Soon To Assume National Proportions

By Donald McLeod Lay

ONE of the most important tendencies brought out at the recent national automobile shows is a strong movement toward body improvement and development, as evidenced by the increasing demand for custom designs. At these shows there were exhibited many more special bodies, or constructions in which the aim was to get away from the hidebound conventionality of the stock type, than were on display at any show of recent years. These attempts to strike a note of individuality, while preserving the best features of modern coachmaking, may be characterized as the forerunners of a more widespread adoption of the ideas which prompted their creation.

The art of the coachbuilder, far from being on the decline, as some of the devotees of the "good old days" would have us believe, is still a long way from the attainment of its highest development. But it is not the further refinement of the horse-drawn vehicle which will be responsible for its progress in the future. The coachbuilder's interest in this field of his work will shrink to comparatively small proportions beside the more attractive opportunities in the increasing demand for smart, distinctive and comfortable automobile bodies.



A typical custom-built body. This is a convertible roadster-coupé mounted on a Locomobile chassis

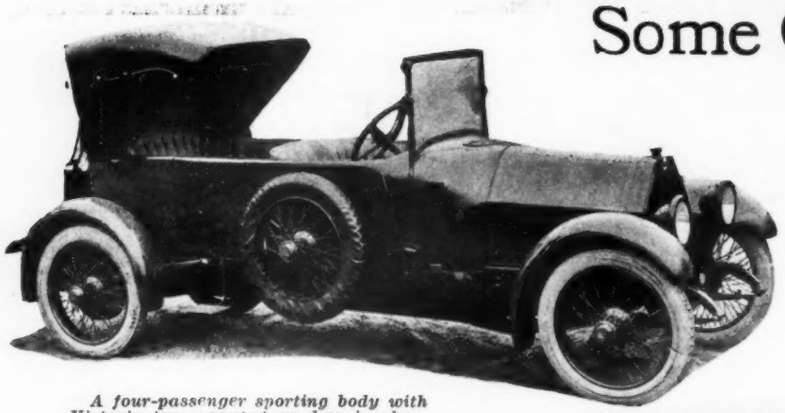
There is a large class in the United States that prides itself upon its fastidious tastes in every phase of existence. It aims to be distinctive, individual, and to have everything in life to correspond. Clothes must be smart, elegant and well tailored; homes must be artistic backgrounds for personalities; food must be dainty and delicately prepared and must represent the most exquisite dishes money can buy; and so throughout the establishments, everything must be in keeping with these standards.

Want Something Different

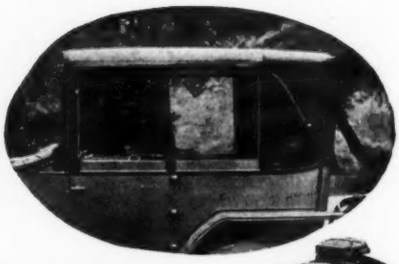
In other words, people of this class are not usually satisfied to accept the stock bodies sold by the American automobile manufacturer. They want something different, and as the number of cars in use increases each year, so will this demand for specially-designed and built bodies grow larger and larger as more car purchasers adopt the custom construction.

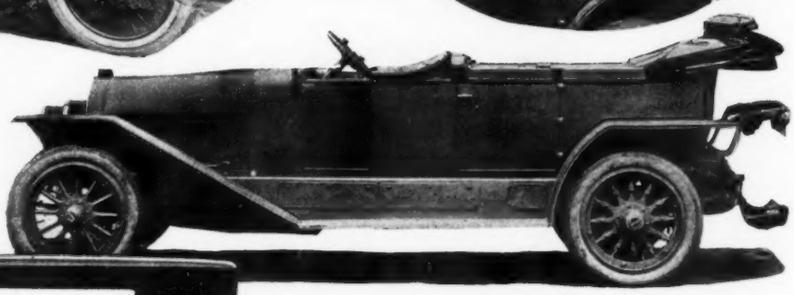
There are thousands of people throughout the country who, though not rolling in riches, are sufficiently prosperous to be able to afford the additional expense entailed by satisfying their sense of the fitness of things as re-

Some Custom Designs of Di



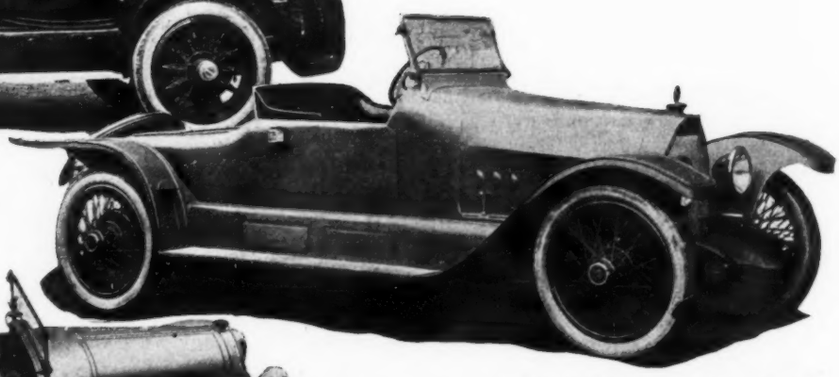
A four-passenger sporting body with Victoria top mounted on Lancia chassis. Note oval fenders, absence of running board and mounting of spare wheel



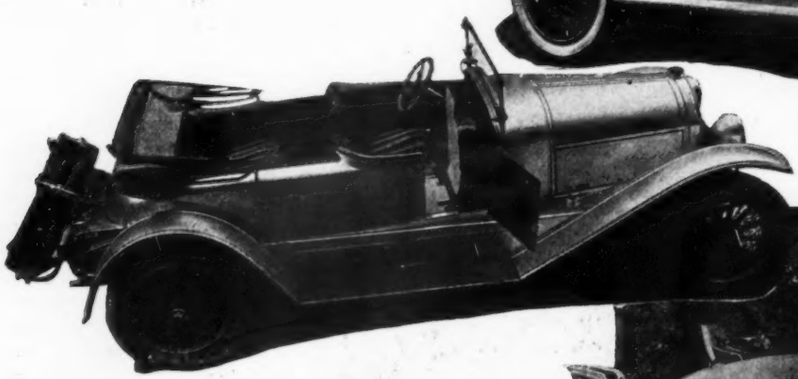


A special collapsible design produced by Locomobile. Below it is illustrated with top and sides folded and above with the top raised although the side windows are lowered

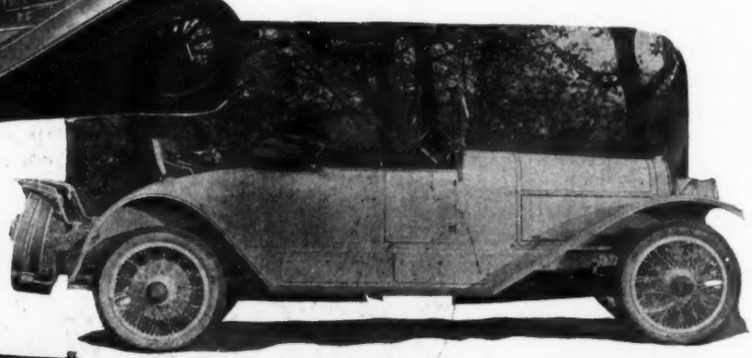
A permanent top product by Locomobile which may be quickly converted into an open body by lowering the windows



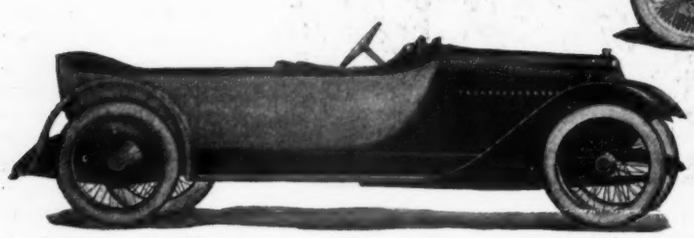
A four-passenger roadster with folding rear seat mounted on an Owen Magnetic chassis.



View of the body outlines and seating arrangement in a special Locomobile job exhibited at the National shows



Another excellent example by Locomobile of the latest four-passenger body construction in which the rear seat disappears in the turtle back

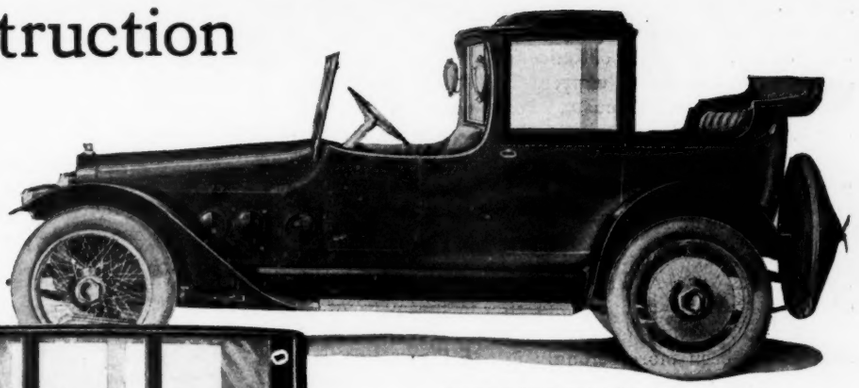


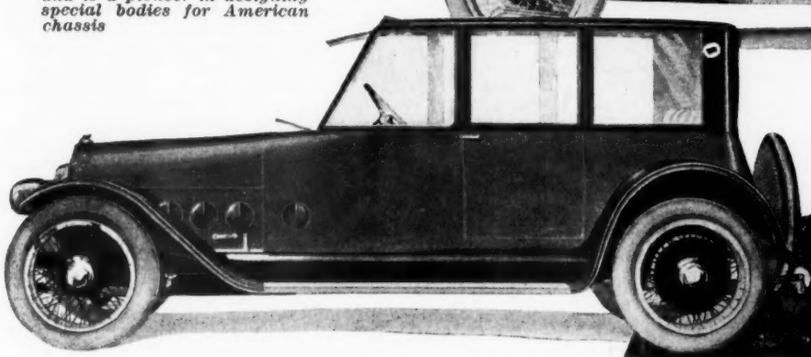
Aquatic touring body by Holbrook. The general lines are like those of a boat. It is mounted on a DeDion-Bouton chassis

Distinctive Construction

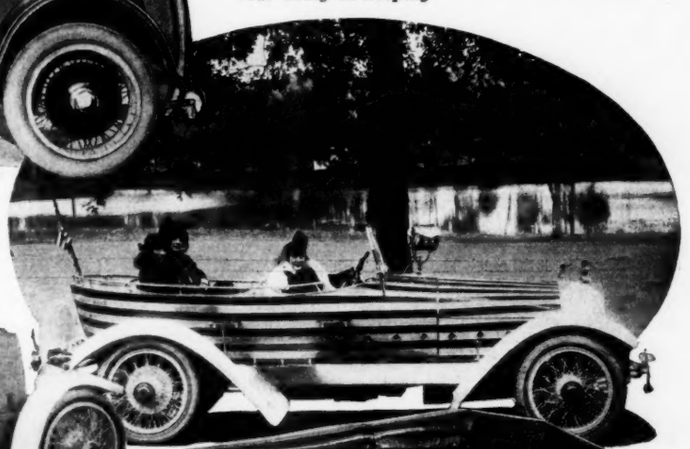
At the right is a special brougham with landaulet top designed by C. T. Silver for an Overland, Willys-Knight or Peerless chassis

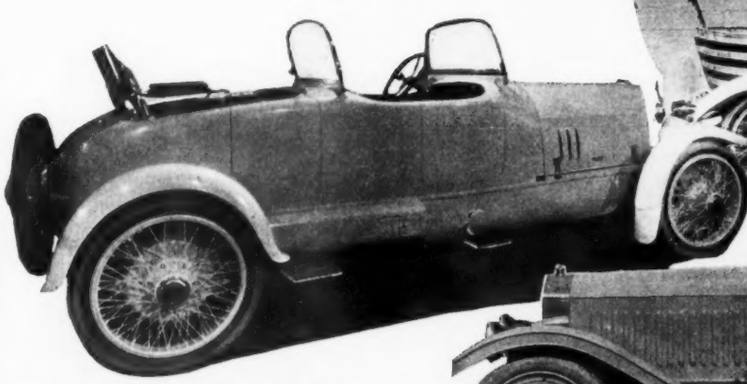
Below is a four-passenger sedan designed by Mr. Silver for the same chassis. Mr. Silver represents these cars in the Metropolitan district and is a pioneer in designing special bodies for American chassis



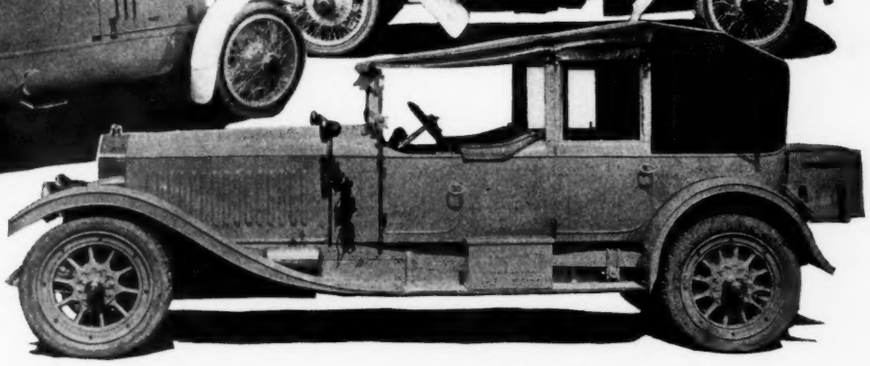


Below is illustrated Mr. Silver's masterpiece, the Silver Bird, a design in which the boat idea is carried to the extreme, every detail from the anchor bumper to the nickel propeller at the rear being in keeping

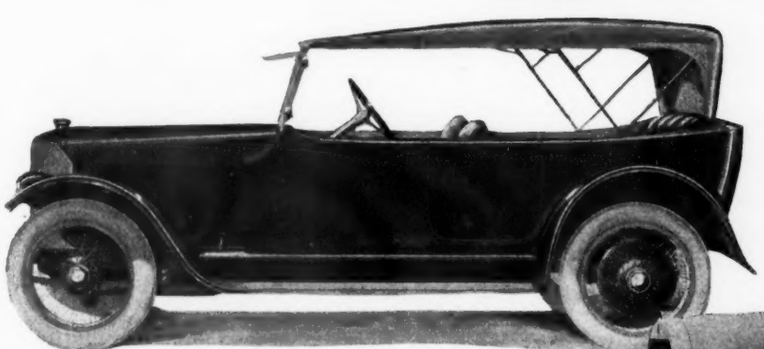




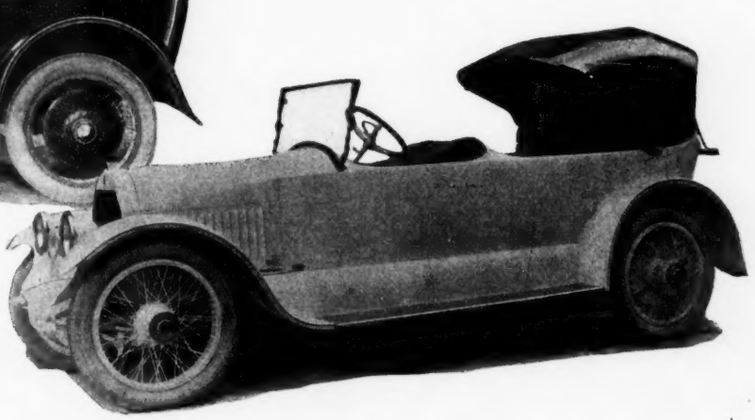
A torpedo-style four-passenger sporting type with folding rear seat and two windshields mounted on a Singer chassis



A luxuriously comfortable touring design suitable for all kinds of weather on a Rolls-Royce chassis. Note lines of top



A streamline Bender & Robinson design on a Singer chassis. Note the extremely smooth lines which are unimpaired when the top is down, as it folds into the body



An attractive streamline touring body with Victoria top designed by Holbrook. It is mounted on a Cadillac chassis

gards the comfort and appearance of their cars. To-day most of them take the stock bodies without comment because they have had no opportunity of seeing what the expert coachmaker can do to express individual ideas and tastes. But when the wave of custom body design, which now seems to be gathering momentum in the East, begins to spread over the land, these people will be the first to take advantage of the new trend.

New York the Fashion Center

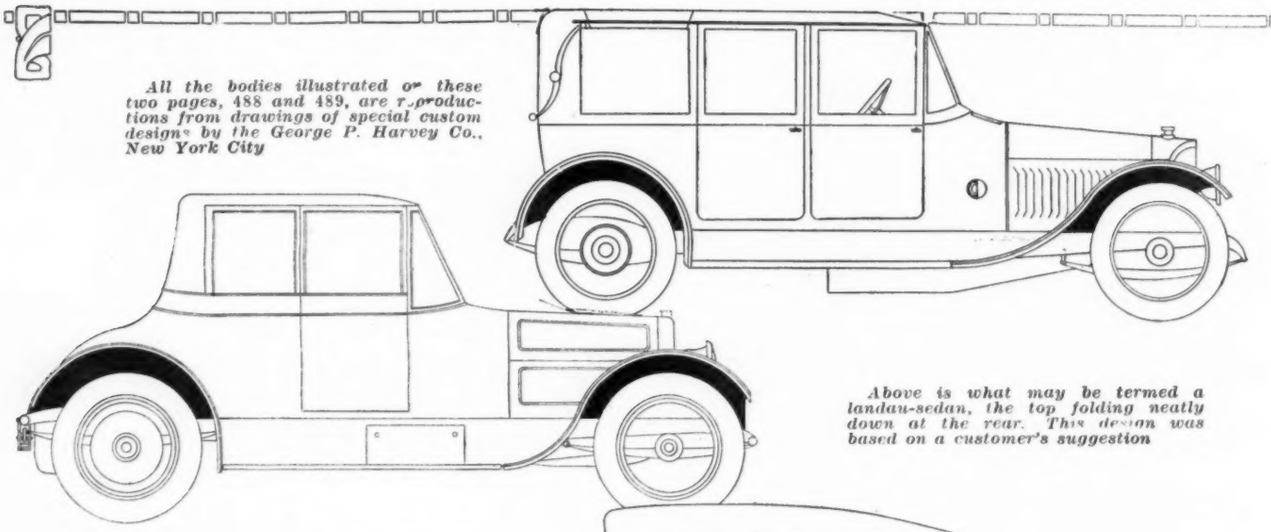
Of course New York City is the great center for the custom body trade in America to-day. Ever since the first days of the automobile industry, when the majority of the cars in New York were of foreign construction, European influence has been more strongly felt in that city than in any other section of the country. It was not many years before the wealthy families who were recognized as the leaders of fashion began to import chassis either separate or fitted with a specially-built body, designed to order by one of the celebrated coachmakers of Paris or London. This vogue, however, grew but slowly, because an imported chassis and body were not within the reach of many, even of the more prosperous classes, in those days. More recently, of course, foreign-built cars and bodies have become less a rarity then formerly, but it was apparently some time before anyone thought an American-built chassis was worthy of carrying a custom body.

Still, the fact that special automobile bodies were a distinction possessed only by members of the Four Hundred, set the fashion for the élite, the would-be-élite, social climbers, nouveau riches, etc. All set about procuring something distinctive, striking and frequently conspicuous, when the purchaser's taste was not as highly developed as it might be. Most of them, of course, bought European-made chassis on which to mount the new body, but some were not disposed to go to such expense and invested in an American machine, hoping that the body would disguise it sufficiently to prevent it being recognized as a domestic product.

Thus the custom-designed body increased in popularity year by year, the types built by New York coachmakers to the orders of customers ranging from the most unpractical and freakish offsprings of an untrained imagination to the most comfortable, luxurious and highly refined examples of the art ever turned out. More and more people saw these special creations running about the streets or along country roads and became imbued with the desire to own cars having the same distinctive qualities. The most enterprising dealers recognized this growing demand and proceeded to prepare special designs applicable to the chassis of the cars they handled, and thus was the American custom body industry inaugurated.

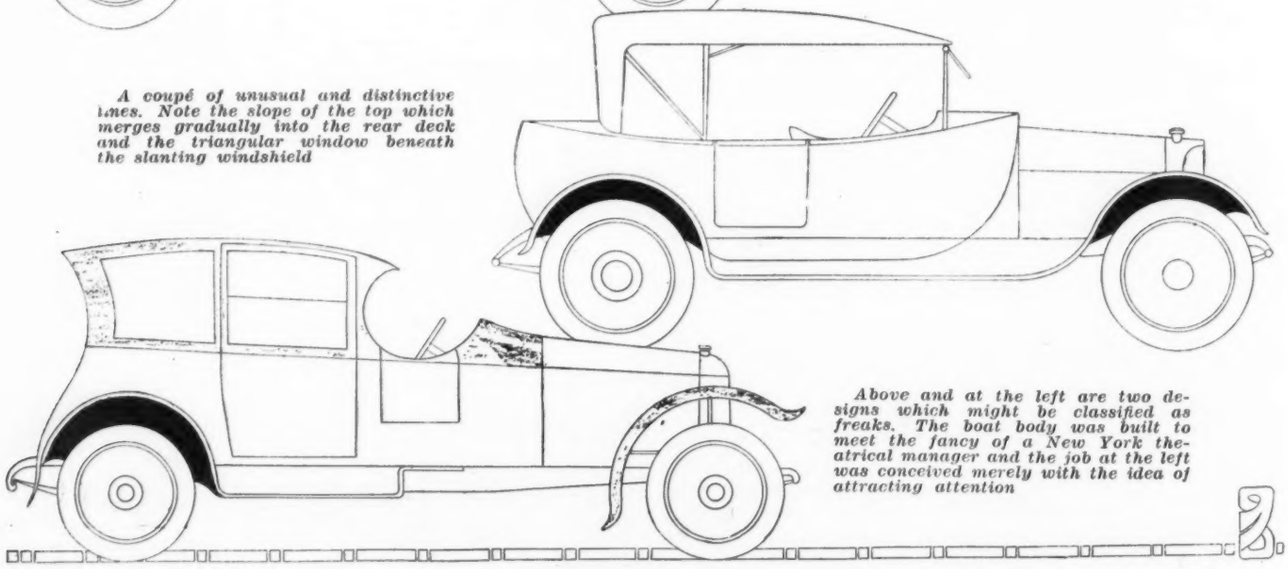
To-day the number of firms designing and building bodies especially for the custom trade is growing almost from day to day. New concerns are springing up in all parts of New York City and neighboring districts, while the old established coachmakers find that the equine phase of their business has

All the bodies illustrated on these two pages, 488 and 489, are reproductions from drawings of special custom designs by the George P. Harvey Co., New York City

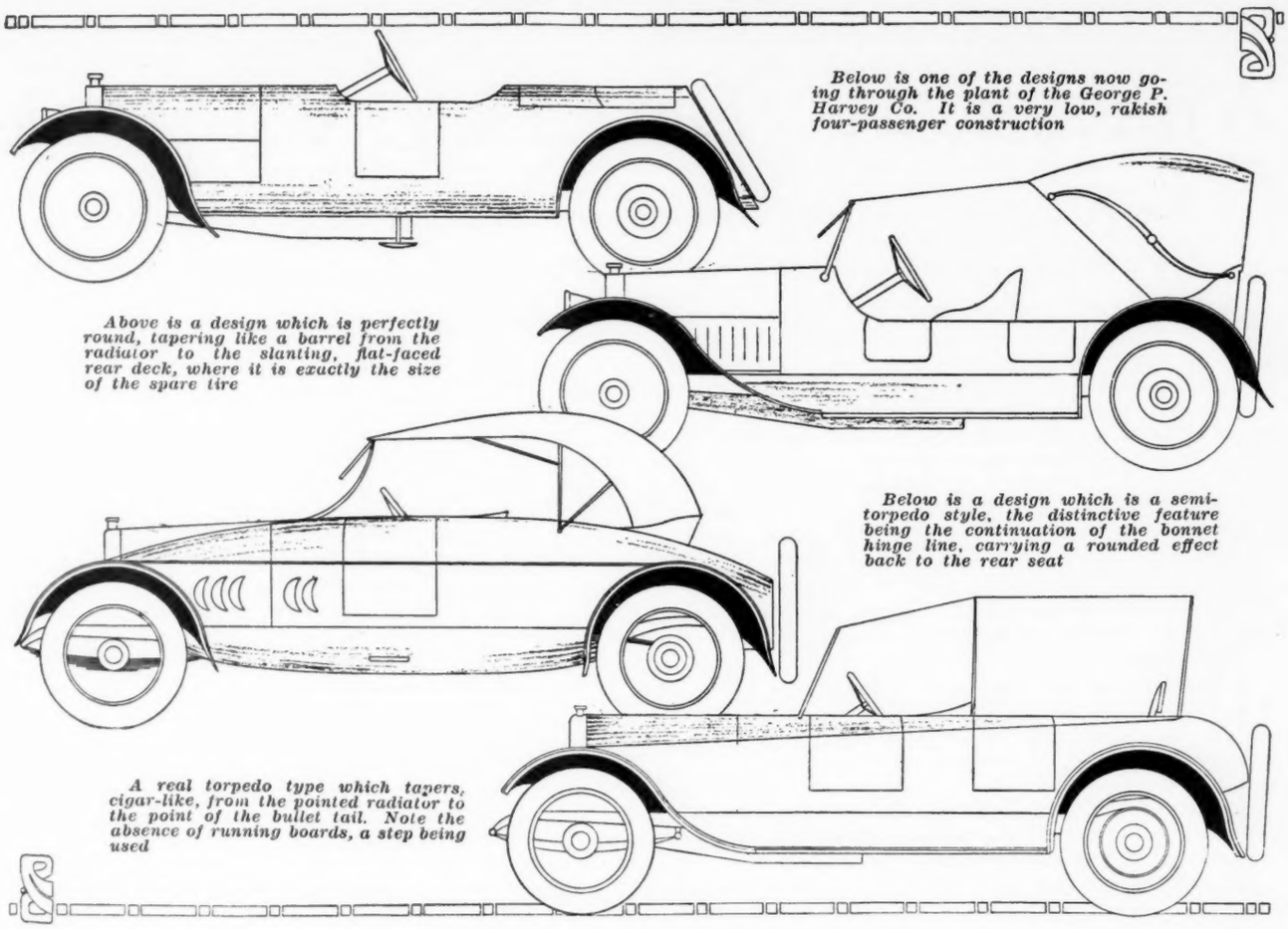


Above is what may be termed a landau-sedan, the top folding neatly down at the rear. This design was based on a customer's suggestion

A coupé of unusual and distinctive lines. Note the slope of the top which merges gradually into the rear deck and the triangular window beneath the slanting windshield



Above and at the left are two designs which might be classified as freaks. The boat body was built to meet the fancy of a New York theatrical manager and the job at the left was conceived merely with the idea of attracting attention



Below is one of the designs now going through the plant of the George P. Harvey Co. It is a very low, rakish four-passenger construction

Above is a design which is perfectly round, tapering like a barrel from the radiator to the slanting, flat-faced rear deck, where it is exactly the size of the spare tire

Below is a design which is a semi-torpedo style, the distinctive feature being the continuation of the bonnet hinge line, carrying a rounded effect back to the rear seat

A real torpedo type which tapers, cigar-like, from the pointed radiator to the point of the bullet tail. Note the absence of running boards, a step being used

dwindled to almost insignificant proportions, the bulk of their trade now being in special bodies for automobiles. And all these companies are having no difficulty in obtaining business; in fact, most of them have more work on hand than they will be able to complete for some time. It looks as though the coachbuilder has come into his own, so far as the eastern section of the country is concerned.

New York is the great fashion center for body design just as it was in the early days of the industry when the only basis for these fashions was furnished by the products of European designers. The growing vogue of the custom-built body is bound to spread to other cities; in some of them, Boston, Chicago and Philadelphia for example, its influence has already been felt, and during the coming season it should become more and more a factor with the car-buying public, not only of the large cities but also of the smaller communities. Even the small towns of but a few thousand inhabitants each have several families sufficiently opulent to be attracted successfully by the advantages and attention-compelling qualities of special bodies for their cars.

A National Field

This opens up a vast field which should be developed during the coming years. The new ideas and the refinements in material, construction and design, brought out by the demand for the unusual, the beautiful and the durable in body work are bound to produce a marked effect on the stock body which the American automobile manufacturer will furnish with his car. It may be that more manufacturers will establish custom body departments as some of the high-priced car manufacturers have already done. It may be that stock bodies will be developed which may be changed readily in almost every respect to meet the requirements of the car buyer. The possibilities of the changes which may be thus indirectly brought about are so boundless that speculation is useless.

From present indications it would seem that the American custom body trade is graduating from a mere local occupation of negligible importance to a branch of the great automobile industry which will be national in scope, and involving thousands of men and immense capital. This will be the logical result of the formative conditions prevailing during recent years and at the present time. The demand is there, and where there is demand supply is usually forthcoming. The accelerated activity in the custom body field in New York City is significant of what may be expected, though probably in a lesser degree, first in the other large centers of population and later in the smaller communities.

Car dealers, particularly the more progressive, are featuring the attractions they are able to offer in the way of furnishing their customers with special bodies which will incorporate any of the car-buyers' ideas regarding appearance, comfort and construction, although most of the dealers are far-sighted enough to point out the impractical side of any suggestion which would be likely to result in ultimate dissatisfaction to the purchaser. Many employ designers especially to carry out the ideas of prospects desiring special bodies while others maintain close relations with coachbuilders, permitting them to furnish everything from drawings to the complete body.

Illustrative of the value of suggestions made by car-buyers to the body builders, and frequently these car-buyers know practically nothing of automobile construction, one coachmaker declares that he secures far more original and practical or near-practical ideas from his customers than from all of his competitors combined. And all report that customers are more numerous than ever before, because of increased prosperity and a wider recognition of custom bodies.

Analyzing Engine Cooling

An Accurate Determination of the Factors Affecting Cylinder Cooling and a Quantitative Examination of Air and Water Cooling Comparatively

Results of F. W. Lanchester's Researches Reviewed by A. Ludlow Clayden

PROBABLY no automobile engineer in the world has a greater reputation for originality than F. W. Lanchester of England. Mr. Lanchester was one of the first people to build an automobile in England and adopted an air-cooled engine. After using this for some years difficulties commenced, and a water-cooled motor was substituted. For the last five or six years Mr. Lanchester has not been connected actively with his original company, but has been doing consulting engineering and has given much time to original research.

In December, 1915, he presented to the British Institution of Automobile Engineers a paper dealing with cylinder cooling both by air and by water. This paper is of immense length, containing ample matter for a fair sized text book, and in it the mathematics of the subject are considered in a clear and fairly simple manner. The object of the whole investigation was to determine the relative advantages of air and water cooling in absolute terms.

Mr. Lanchester showed and proved that; weight being of primary importance in the automobile and more strongly still in the aeroplane, air cooling is the lighter system up to a certain cylinder size above which it ceases to save weight. The exact quantities of water and air to give theoretically correct cooling are determined in the paper and an examination made afterward to gage the relative weights.

Anyone deeply interested in the design of light engines could not fail to find this paper of real value, but it is much too long for it to be possible to reproduce it in THE AUTOMOBILE. In the following pages just the highest spots are brought out, and the mathematical proofs are omitted.

All Engines Air Cooled

In the paper it was first pointed out that automobile engines are all air cooled since the water in the ordinary cooling system merely acts as a carrier which can transfer the heat to the atmosphere. In pointing out the importance of having the greatest possible surface in a radiator in proportion to the volume of water carried, the author stated that a ¾ in. pipe will contain 1 lb. of water per square foot of surface, whereas in a properly designed honeycomb radiator the weight of water need not exceed 2 or 3 oz. per square foot surface. The object of emphasizing this point was to bring home the fact that the purpose of the radiator is to transfer to the air the heat which it is necessary to dissipate. The surface of the tubes in a radiator acts in precisely the same way as the surface of the gills on an air-cooled cylinder and the purpose of the water is to transfer heat from the small area of cylinder wall to a much larger area in the radiator, since the water is only a carrier it is obvious that the larger the radiator surface per pound of water the less water shall be required to insure effective cooling. We may now proceed to quote from the paper concerning Mr. Lanchester's first design for an air cooling engine.

Complementary to the problems associated with water circulation the automobile constructor from the earliest time has had to face the question of the circulation or free flow of the air.

The most prevalent defect or difficulty to-day, as concerning the flow of air, is the restriction commonly experienced in getting the air away from the bonnet. Thus large apertures beneath are inadmissible as admitting dirt and mud in quantity; ventage in the top is out of the question, and the rear is choked with mechanism. Louvres at the sides offer an obvious solution, but these are generally speaking banned as unpopular.

When we turn from cooling by water circulation to direct air cooling we encounter at once the main difficulties of the problem in an aggravated form. The motor cycle, especially the bicycle, is to some extent under the same conditions as the flying machine—it always operates between certain maximum and minimum speed limits, also the motor is rarely or never required to run with the machine standing. The motor cycle, however, is not so favorably situated as the flying machine inasmuch as its cooling may be seriously interfered with by a following wind.

As regards the air cooling of the full weight motor car, the author believes he can claim to have been responsible (in England at least) for the only serious attempt at air cooling on a commercial scale, namely in the Lanchester 10 and 16 hp. cars manufactured between the years 1900 and 1904.

In the design of his first air-cooled car, the author made very careful calculations of the jacket conductivity and surface required, but at that date, 1895, he had not at his disposal a reliable estimate of the total heat to be carried away, neither had he developed at that time the theory of surface cooling on the lines of his more recent work.

In the first experimental engine the gills were of copper, cast with a small percentage of zinc in order to secure fluidity; the conductivity was carefully calculated. The data for the calculation of the surface required were non-existent, and in this respect also the author had to rely upon some rough experiments conducted on his own account. Ultimately the total surface was regulated by the fact that it was found impossible with cast copper gills to get too much; the gills were therefore cast as separate plates as thin as possible and were spaced 5/16 in. pitch; the necessary air-way was calculated on the same basis as in the present paper. In other words, the total cross section of air-way in the jacket was designed to pass an ample volume of air under the available fan pressure; the fan was of centrifugal type formed by vanes on the flywheel rim. It should be noted that the centrifugal fan acted by pressure, the air being collected in an expanding conduit and delivered to the jacket at a pressure of about 1 in. water gage above atmosphere.

Certain improvements were effected in the jacket detail; spun or pressed sheet copper plates of light gage and pitched closely were substituted for copper castings. Cast aluminum gills were also tried with apparently equal success. Data as to these jackets are given in Figs. 1 and 2. Fig. 1 is a section

of the jacket in which the gills are of cast aluminum, and Fig. 2 the alternative construction, in which 24 s.w.g. sheet copper is employed. In the two arrangements discussed, the author considers he had reached a high standard of efficiency in direct air cooling; the difficulties seemed to be virtually conquered. Unfortunately, in remodeling the design with a view to convenience in manufacture, concessions were made in the cooling arrangements in order to facilitate production. Thus the pressure fan was found to be very difficult to embody in the design, and eventually a suction fan was substituted. Again difficulties arose in the design of a cylinder and valve gear which would permit of the attachment of the copper gills, and probably the author committed an error of judgment in allowing himself to employ cast iron, that is to say, to substitute motorcycle practice for the practice which he had developed himself and which was undoubtedly far more efficient. The type and general arrangement of the centrifugal fans with friction drive as fitted in the later models (the 10 hp. and 16 hp.) are clearly shown in Fig. 3; this figure is self-explanatory, a comparison with Figs. 1 and 2 will show the extent of the sacrifice made to facilitate manufacture.

Suction Fan Bad

The suction type of fan also is bad; firstly, it is far less efficient, owing to the fact that no use is made of the velocity of the air leaving the fan. Secondly, as the jacket gets hotter the fan pressure gets less owing to the lower density of the heated air. When the first few cars were put on the road with these modifications a tendency to overheat was at once evident and it became necessary to greatly increase the draught. To this end frictionally driven fans were fitted in the place of the fan flywheel, and although by this means the cooling was rendered possible, the consumption of power became serious.

Having thus reviewed the subject in a general way, the author next proceeded to discuss the quantity of heat which it is necessary to dissipate.

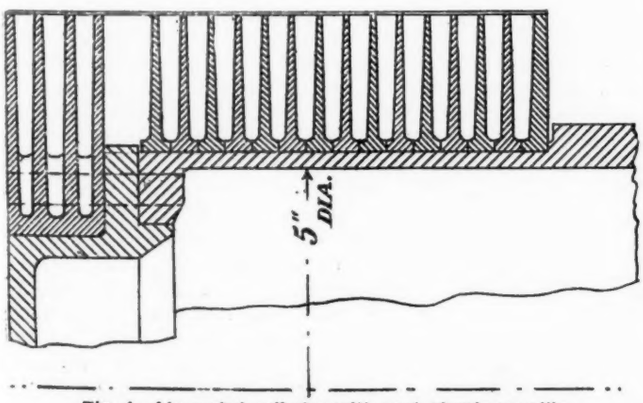


Fig. 1—Air cooled cylinder with cast aluminum gills

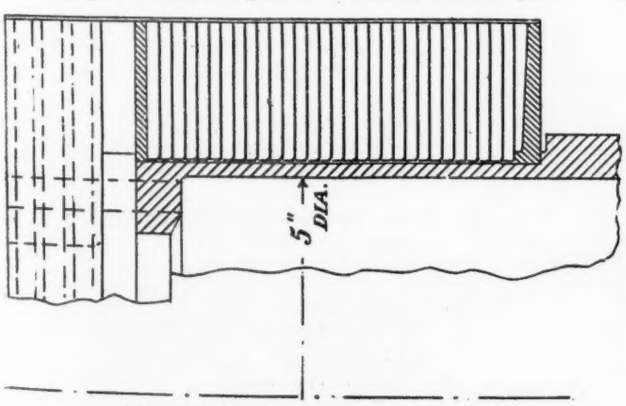


Fig. 2—Cylinder with sheet copper gills

From the practical side, modern experiment appears to show that the total jacket loss for any given engine:

(1) Is not (at full load) constant with regard to revolution speed, but increases as the speed increases but not in like ratio. Thus it is neither constant as an *amount of heat* lost nor as a *percentage of the total fuel heat*, it is something between the two. It may be accounted for approximately on the basis of a portion being a constant loss, and the remaining portion a constant percentage of the total heat. The heat loss may be represented by a diagram as in Fig. 4. This diagram has no pretensions to minute accuracy since much depends upon the design; it does, however, represent as near the truth as can at present be expressed in general terms. The upper of the two diagrams, Fig. 4a, gives the relative jacket heat loss for variations of piston speed. The lower, Fig. 4b, gives the jacket loss expressed as a percentage of the total heat value of the fuel. Abscissæ give the *cylinder diameter* × *mean piston velocity;* the units are the foot and the second.

(2) The jacket heat loss within ordinary limits is independent of the compression ratio.

(3) The jacket heat loss appears to vary approximately as the square of the strength of the mixture, or the heat loss expressed as a *percentage* varies directly as the strength.

(4) In an engine governed by throttle the *percentage* jacket heat loss is greater at low power than at full load.

(5) If the timing of the ignition be varied the *percentage* heat loss is greater when the timing is early than when late. Expressed, however, *in terms of the power developed,* the loss to the jacket is least when the ignition timing is *a little later* than that of maximum torque. This aspect of the subject is important; the question, in the case of an engine tending to overheat, is commonly the performance of a given task. Thus an automobile is less liable to boil its water when hill climbing, if the ignition is *very slightly* late.

Rule for Heat Loss

Thus we have the following rule for the expression of the heat loss:

The mechanical equivalent of the heat lost to the walls of the cylinder and combustion space in an internal combustion engine of ordinary type, may be expressed as equal to one-tenth of the mechanical equivalent of the heat value of the fuel consumed, plus 1 *hp. for every inch of cylinder diameter.*

The part of the heat loss which is a constant percentage of the total (*i.e.* mainly that lost as internal radiation) may alternatively be expressed as a percentage of the engine power, since this bears a fairly constant proportion to the total: it is roughly equal to one-half to one-third of the indicated horsepower, according as the thermal efficiency is about 20 per cent or 30 per cent.

Where a multi-cylinder motor is in question the diameter measurement will be the sum of the diameters of all the cylinders in inches.

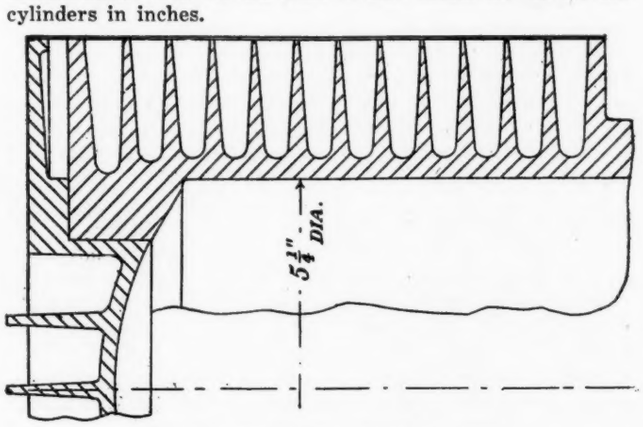
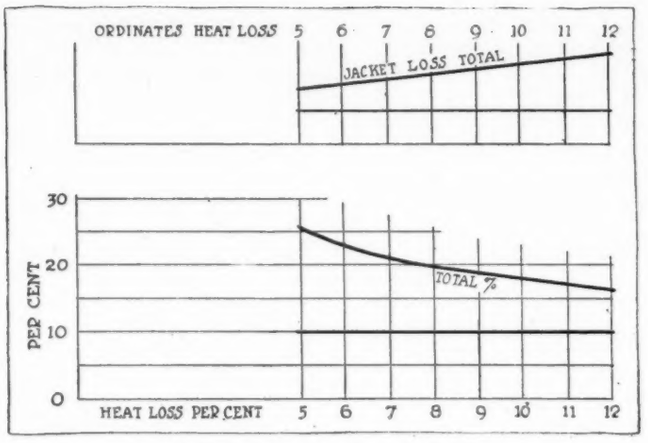


Fig. 3—Cylinder with cast iron gills



Diagrammatic Heat Loss Curves

It must be clearly understood that the foregoing does not include the heat discarded beyond the exhaust port; heat imparted to the exhaust pipe, if it is to be provided for in the jacket system, must be counted as extra.

It is also important to make it clear that the "radiation losses" discussed in the present section are not the same radiation losses as those sometimes referred to in works on the subject. The losses with which we have been concerned are those due to the radiation *from* the incandescent gases *to* the cylinder walls, whereas radiation losses are frequently spoken of as the radiation *outward* from the piston, jacket, and other portions of the engine, more especially as affecting the heat account when that is determined by experiment.

It will be found on applying the rule to actual examples that it frequently gives results slightly above those measured; possibly the allowance per inch of cylinder diameter is somewhat higher than it should be; however, the round figure 1 hp. per inch diameter is quite near enough for practical purposes.

Cases also occur in which the measured jacket heat is considerably greater than given by the rule, but in all these cases it will be found that exhaust heat, that is to say heat from the exhaust pipe, port, etc., is being included in the jacket loss. Either the water jacket extends around the valve box and branch, or a great deal of heat is communicated from the exhaust passages to the water jacket by conduction.

It will be shown later that when we come to the consideration of the problem of direct air cooling it is convenient to express the heat passing into the cylinder walls in terms of either *heat units* or *horsepower per unit area.*

Thus, for example, in the case of a cylinder 4 in. diameter by 6 in. stroke developing 12 hp. on a consumption of 8 lbs. gasoline per hour, the waste heat will be the equivalent of $6 + 4 = 10$ hp. Now the cylinder and compression space wall of such a cylinder would total up to about 0.75 of a square foot, so that we may express the heat loss as having a mean value of 13 *hp. per square foot* or 2.5 *calories per square centimeter per second.* The distribution of the heat loss, however, varies considerably, it is far higher in and near the combustion space than in the cylinder wall proper. The continuation of this discussion takes its place later in the paper.

Conduction Through Cylinder Wall

The passage of heat through the cylinder wall is controlled by the conductivity of the latter. The scientific basis by which the conductivity of a material is defined is the measure of the parallel flow of heat through a given sectional area of the substance for some stated temperature gradient. Thus employing C.G.S. units the area of cross section taken is one square centimeter, the gradient is 1 deg. C. per centimeter, and the quantity of heat transmitted, in (gram) calories per second, is the measure of conductivity. In other words, if we imagine a one centimeter cube of metal, of which two opposite faces are maintained at a difference of temperature of 1 deg. C., then if the amount of heat flowing through the cube under these conditions is sufficient to raise 1 gram of water 1 deg. C. per second, the conductivity of the said metal will be unity. This is approximately the conductivity of pure copper. The conductivity of copper and of other of the metals commonly emloyed by the engineer is as below:

Copper	0.9 to 1.0
Aluminum	0.5
Brass	0.25 to 0.3
Iron or Steel	0.15 to 0.2
Cast Iron	0.11 to 0.12

The conductivity of heat through the cylinder walls is one of the factors by which the maximum size of cylinder which can be employed (in an internal combustion engine) is ultimately limited. For a given number of heat units per unit area transmitted to the cylinder walls it is clear that the *temperature gradient* will be constant, and thus the difference of temperature between the inside and the outside of the wall of the cylinder and combustion space will vary directly as the thickness. The result of this is that, whatever the material employed may be, sooner or later a limit of thickness is reached at which the stresses set up in the material due to inequality of expansion result in its disruption.

If the relative conditions are to remain constant for variations of size, the conductivity of the material needs to be increased in proportion to the linear size. There is no way by which this can be practically effected.

As an example, the temperature gradient within the cylinder wall based on the mean value of heat flux above given ($= 2.5$ calories per square centimeter per second) may be given. Assuming the conductivity of cast iron $k = 0.11$, we have, *gradient* $= 2.5/0.11 = 23°$ C. per centimeter.

(b) *Conduction by Gills; and*

(c) *Heat Transference from Gills to Air.*

In a direct air-cooled engine the function of the gills is to carry the heat from the outside of the walls of the cylinder and combustion space and convey it by conduction radially outward, and eventually to give it up to the surrounding air. Thus the surface of the gills requires to be of sufficient area to dispose of the heat to the air, and the section through the gills, that is to say, the sectional area of metal taken normal to the heat flow, must be sufficient to transfer the said heat by conduction without too great a temperature gradient.

Thus the calculations of the gills involve two distinct problems: (1) the problem of the conductivity as in the case of the cylinder wall; (2) the problem of the surface disposal of heat, that is to say, the passage of heat from the surface of the conducting metal to the surrounding air.

Stated briefly, a definite relation is established between the velocity of the air over the surface, the temperature difference, and the rate of heat loss. In addition to this the power *necessarily* lost in cooling is also established in relation to the other quantities. The results of the investigation may be expressed either in diagrammatical form, or in the following equations:

If θ = temperature difference (degrees F.) between hot surface and atmosphere, and

V = velocity of air; ft./sec.

$\frac{\theta V}{15{,}000}$ = hp. equivalent of heat dissipated per sq. ft. of surface.

and

$\frac{V^3}{100{,}000{,}000}$ = hp. expended per sq. ft. in skin friction, representing the theoretical minimum work done in cooling.

(To be continued)

Results from a Special Spring Suspension Developed for Brewery Trucks and Applicable to Automobiles

Increased Load Capacity Gained by Larger Flexibility and Range of Action—Stability Secured by Coupling Auxiliary Coil Spring for One Wheel with That for Its Mate—A New Factor in the Coupling

Data from an Exceptional Installation Which Has Been Tried with Modifications for Several Years, the Effects Being Noted in Operative Results as Well as in the Upkeep Accounts

By Marius C. Krarup

GREAT reluctance against employing a very flexible spring suspension for heavy, load-carrying commercial motor vehicles is commonly observed among both makers and users and is probably mainly due to four factors: (1) The stability of the load suffers, (2) jolts are aggravated under certain conditions (two potholes in quick succession and similar causes) unless suitable shock absorbers are used, (3) the spring dampers or shock absorbers in the market are not robust enough for heavy loads supported on very flexible springs and (4) a flexible suspension of good quality costs more than a stiff suspension. On the whole, while the waste of power and wear on tires and mechanism due to the toss of the body and load over a set of stiff springs are aggravated for the average running, acute troubles are more liable to occur with flexible springs, unless a reliable system is devised for managing the flexibility automatically in a way that is suitable for all—ALL—road formations and vehicle speeds that must be contemplated as possible. Such management has not so far been found practicable for heavy vehicles, especially not for those made topheavy by their loads and calling for strong forces to oppose rolling and pitching. The majority will rather take their chances with a stiff suspension—one stiff enough to keep all irregular movements of body and load within a small range of action, even if the shocks causing such movements are received on one side of the vehicle only—than with any proposed remedy for the brutal shocks, harmful vibrations and relatively high operating and upkeep cost inseparable from its use. The troublesome steering usually associated with a flexible front suspension also has to do with the preference for small spring action and must be remedied before the benefits of a higher degree of flexibility can become wholly acceptable.

Relief is sometimes sought in flexible tires or spring wheels — whose spring action does not affect the steering perceptibly—but it is too often overlooked that any tire or spring wheel which flexes considerably under the load it carries consumes a large share of the power used for propulsion and that the power so wasted in the useless continuity of flexing incidentally wears out the tire or spring wheel itself, thereby causing additional expense. Only when roads are uniformly rough and the vehicle speeds are high is the account balanced, as between gain and loss from springs of the rotating type—elastic tires and spring wheels—the gains in that case coming from their prompt interception of shocks an instant before the leaf springs are attached, the flexibility which they add to the total suspension and the well-known special advantages of pneumatic tires in absorbing small obstacles without vertical rebound. But even these advantages are not under all road conditions compatible with the stability required for high loads.

A Useful Paradox

A high degree of flexibility should therefore preferably be secured through the spring suspension proper for all relatively slow vehicles, and not be derived to any considerable extent from the tire equipment, whose proper function here becomes that of securing friction for traction and of reducing noise and vibration. But such flexibility must be reconciled with stability, which means the avoidance of pitching and rolling, lurching and teetering, the management of load-toss, rebound and oscillations and also the safety of steering. In its briefest form the problem of good "springing" is simply that of COMBINING FLEXIBILITY AND STABILITY. Even the quality of spring material, guaranteeing against sag and variations of tension, may be included under the term of stability, to give full breadth to this useful definition.

Five-ton High Cab "76" with Williams suspension, carrying 6 tons

Every known method for combining stability with flexibility involves some reduction of the flexibility for severe jolts and much guiding of it into narrow paths of action. The damping of rebound is always included in some degree, if only incidentally, but is not always systematically controlled. Its effectiveness is at all events limited, being greater in proportion as the running-gear is heavy. Pitching is mainly reduced by using flat springs and checking the rebound.

A Brave Departure

While many pleasure cars have had the flexibility of their suspensions very materially increased by means of the Westinghouse air spring equipment and a much larger number of them are fitted with auxiliary coil springs, which provide a short range of flexible spring action especially adapted for coping with the small rugosities of paved city streets, a case in which five-ton trucks have been operated for years with a suspension about twice as flexible as that provided by the manufacturer is so exceptional as to deserve more than passing attention, for the sake of the vital principle it illustrates as much as for the details of the construction employed. Such a suspension is that provided for two Ebling brewery trucks in New York City by Mr. W. R. Williams. Its history and characteristics are given in the following, and it will be noticed that the principal means employed for keeping the truck body and load on an even keel consists in compelling every one-sided jolt to take effect upon the supplementary helical springs on both sides, so that not only is the suspension less flexible for jolts that strike one wheel only than for those striking a pair of wheels squarely, but a certain action is communicated from the side where the jolt is received to the other, tending to extend the leaf spring on this other side, against the gravitation of the axle, but at the same time tending to compress the supplementary helical spring on the same side. This action seems in practice to have a tendency to make the frame on that side follow the vertical movements of the frame on the side where the jolt is received. The complication of factors at work is considerable—too considerable for safe reasoning with different road formations in mind—and the results obtained in practice therefore become so much more interesting.

The Latest Actual Construction

The construction of the Williams spring suspension actually in use on Ebling brewery trucks does not correspond fully to what the designer would consider ideal arrangements, as the installation had to be adapted to the original equipment of the two 1910 Mack trucks to which it is applied and some changes in the shapes and heights of attachment of the front leaf springs might be desirable, but, such as it is, it has given the results referred to later. It is shown in detail in Fig. 1, giving the rear suspension, and Fig. 2 for the front suspension. It will be noticed that in both places the rear end of each leaf spring supports the frame of the vehicle through the intermediation of a large supplementary helical spring, of the railroad truck spring variety; that the movements of the leaf spring, as well as of the coil spring, are guided by means of a 15 in. lever, by bar and shackle connection, and that these levers on opposite sides of the vehicle are made integral with a cross-bar and therefore with each other, the cross-bar forming the pivotal axis for the turning movement of the two parallel levers.

The helical springs at the rear are within the frame lines and extend from the top level of the frame down, while those in front bear against projecting ends of angle irons secured under the frame, their low position being due to considerations of accessibility with regard to the motor and other parts. Though these details in the actual arrangements influence the flexibility for one-sided shocks slightly, they can be compensated in the choice of the spring dimensions and do not greatly affect the practical results, as the cross-bars almost equalize the forces acting upon the two helical springs of a pair, whether they are at the ends of the cross-bar or closer together. Theoretically, if the cross-bar were absolutely rigid against torsion and bending as well as in its bearings, one helical spring of double strength could take the place of the pair of them without changing the effects. The different positions of the helical springs in front and rear are perhaps mainly of interest to show the adaptabilty of the whole plan to different truck designs; the cross-bar, in addition to its main function, giving considerable freedom with regard to the location of the auxiliary coil springs.

The supplementary helical springs add of course greatly to the flexibility of the suspension, as compared with the original leaf spring equipment. With a range of action in one of these coil springs of 6 in., the additional range of action produced at the axle is about 3 in., if the axle is about at the middle of the leaf spring, and the slight angularity of the whole spring movement, especially in front, modifies this relation only a trifle. In the appended table giving the

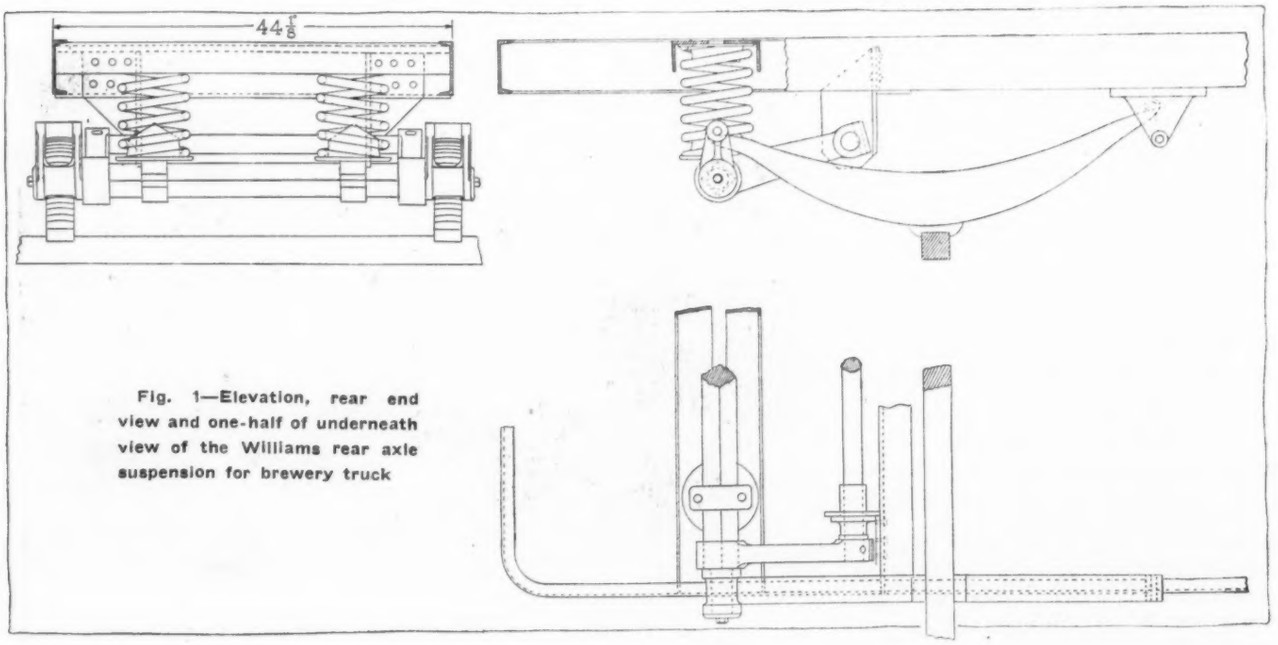


Fig. 1—Elevation, rear end view and one-half of underneath view of the Williams rear axle suspension for brewery truck

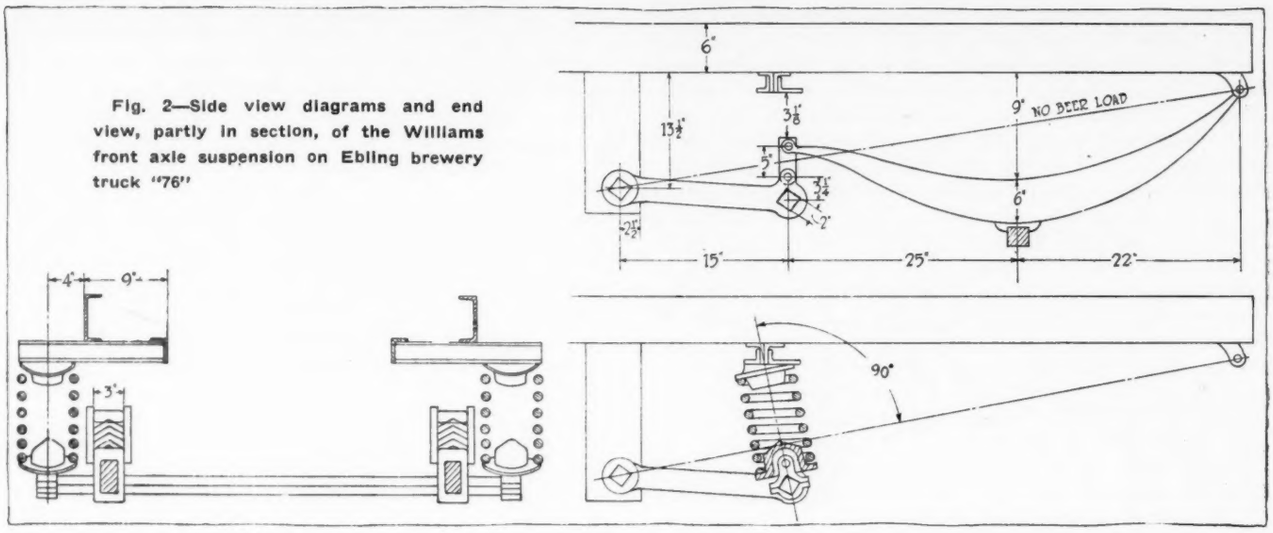


Fig. 2—Side view diagrams and end view, partly in section, of the Williams front axle suspension on Ebling brewery truck "76"

flexibility of the different elements in the suspension, the radical change which is brought about in the relative mobility of the running-gear and the truck body with its load can be followed up in its details. It is so considerable that the question of the means for producing the required stability at once arises. What is there to prevent the body and load from settling down sharply upon the springs on one side of the vehicle, while extending those on the other side, and causing the high load to tip dangerously, and perhaps to oscillate from side to side in a manner that is wholly unacceptable and may set up incalculable forces making for the overloading of the springs on either side and for the breaking of things in general? What, further, is there to prevent the rear end of the load from pulling the rear springs up in the air and pitching forward against the front springs, if the truck is stopped suddenly by the brakes or receives a sudden check from the road, as when it strikes level ground after coming downhill at the rate of speed in which some truck drivers are prone to indulge at times?

If plain leaf springs of a flexibility corresponding to that of the Williams suspension were used, it is known that the results, so far as these undesirable large movements are concerned, would be unacceptable—not to mention what would happen if rolling and pitching were combined, as when a topheavy load coming downhill swings to one side the moment the level is reached and throws the momentum of all the straying forces upon the front wheel and springs at the peak of the turn.

Three Factors for Stability

The provisions which guard against rolling in the Williams suspension comprise three main factors. The cross-bar against which bear the lower ends of each pair of helical springs forms a very rigid rectangle in conjunction with the two guide levers and the other cross-bar, already mentioned, which consolidates these two levers, and, as the four bearings in which the rocking movement of the rectangle take place are also very substantial, this movement cannot depart measurably from verticality in relation to the truck frame, and the greater the tendency is to depart from this desired direction of the movement the greater is the restrictive friction produced in the four bearings of the rectangle. The rolling permitted is therefore no greater than that which could occur with an equipment of stiff leaf springs alone, and, as shall be seen directly, it may be less. The second factor—which is in reality the first and most important one in the origin of the design, working farther back in the chain of causes and effects—does not only resist a tendency to rolling, as the first-mentioned factor does, but obviates such a tendency before it is born. It consists in the action of the united guide levers to compel the helical spring on either side to follow the flexions of its mate, directly actuating it to that effect. By this action every one-sided shock has a less flexible suspension to deal with than a shock of twice as great force which is evenly divided between both wheels of a pair. In other words, the shock which would tend to cause a rolling movement of body and load is more stoutly resisted than one which is squarely received, and, particularly, that part of the spring action which affects the helical springs (as well as the spring reaction, which is frequently more important in affecting the body movements than the first action) is equal on both sides and develops no tendency to roll. The stouter resistance may not be an advantage, but the equalization of movement is.

The square shock on the other hand, receiving the benefit of the full flexibility, develops less tendency to up-and-down tossing of the load at the first impact than would be experienced with a stiffer suspension, while the numerous friction elements introduced in the Williams design must also have a marked damping effect on rebound and oscillations, though apparently not one which has been systematized any more thoroughly than is the case with similar desirable effects produced incidentally, but in lesser degree, in other constructions.

New Effect from Compensating-Bar

The second factor, considered only as the equalizing of the auxiliary spring movements on both sides of the vehicle, is almost identical in effect with that produced under the A. A. Remington patent for Wolseley cars to obviate the roll with cantilever springs—and, according to Mr. Williams, the system in this respect dates back to the buggy age in this country—but the third factor for guarding against roll with the Williams suspension is special and has apparently been incorporated in the design without deliberate intention. The designer does not emphasize it, but it is discernible in the construction. It is hard to trace its exact mode of action under all different conditions of spring and vehicle movements, but it is easy to see that it is present under all of these conditions and to believe that it may be responsible for some of the good results obtained in practice. This factor is the one mentioned at the outset; namely, the arrangement by which the guide levers enter between the two spring elements on each side in such a manner that a compression of both leaf and coil springs on one side causes only the compression of the coil spring on the other side but not that of the leaf spring—on the contrary tending to extend the latter. With the Remington construction the equalizing bar, when turned by a compression of the cantilever spring on one side, transmits a compression movement to the entire spring on the

other side, and, as there is no obstruction in the road on that side to cause the wheel and axle to be raised, the tendency is to lower the body on that side, since the distance between body and axle is reduced by the equalizing-action. With the Williams suspension, on the other hand, whenever the acting forces come from the point of ground contact of the wheel they act alike on the leaf and on the coil spring most directly affected, compressing both; likewise, when the forces affecting the springs arise from movements of body and load, they either cause the compression of both leaf and coil spring or the extension of both of them. But, on the opposite side of the vehicle, and whenever there is question of forces transmitted through the equalizing cross-bar and taking effect at the free end of one of the guide levers, then the coil spring directly affected by these transmitted forces is compressed and the leaf spring is extended, or else the coil spring is extended and the leaf spring is compressed. In all cases, however, some modifications in results are due to the facts that the weight of the body and load is superior to that of the running-gear and that the front end of the leaf spring is attached directly to the vehicle frame.

Without attempting to follow the effects of this third factor in all their ramifications, throughout the complicated oscillation and rebound forces which may arise, it is clear that this factor may be a new and useful one in the art of "springing" a vehicle.

Pitching and Steering

With regard to provisions against pitching and excessive rebound it does not seem to the writer that the construction in itself offers all the safeguards that may be needed, but an examination of the illustrations will show that the usual precautions are observed; that is, there is little opportunity given to the body and load for moving forward with relation to the running-gear or for the transformation of such a tendency into a rebound movement of the rear springs coupled with a compression movement of the front springs. And the obviation of roll also tends to reduce pitching, the consolidation of the springs on the two sides rendering it necessary to overcome a greater resistance to the starting of a pitching movement than would be encountered with an ordinary suspension if it happened that one spring in front and one in the rear were already in a position favorable to a pitching movement, as they may easily be with a heavy load, a bad road and a frame possessing that capacity for torsion which now by many is considered preferable to any attempted rigidity of the frame, which after all cannot be absolute.

It should be added that the designer, Mr. Williams, would prefer to use leaf springs with considerable less curvature than is shown in the illustrations, and such almost straight springs would give additional security against pitching.

There remains to be mentioned the steering. After certain changes had been effected in the proportions of the steering linkage of the original trucks, the steering has been found satisfactory despite the greatly increased flexibility of the front springing, and with the use of nearly straight leaf springs the designer estimates that all "kick" can be eliminated. The changes made in the original steering arrangements of the trucks are illustrated in Fig. 3 and described in connection with that of other steps in the development of the whole system.

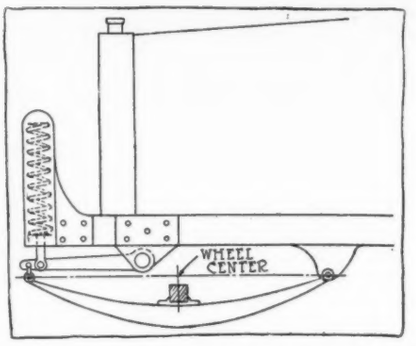


Fig. 4—Williams suspension applied to front of pleasure car

Results in Practice

The results accomplished with the Williams suspension in its progressive stages of development were attested on Jan. 5, 1915, by H. Mehlhop, superintendent of the delivery department of the Ebling Brewing Company, in the following terms:

> "These installations have been very satisfactory.
> "The tire mileage is increased about 50 per cent and the trucks will run about one-half longer without overhauling. The suspension is mechanically satisfactory, requiring very little attention or repairs.
> "About six months ago we equipped one of the trucks carrying your suspension with a heavier rear axle and springs, and since that time this truck has been carrying 60 to 65 halves. This has been so satisfactory that we intend equipping two more trucks with your suspension this winter, and finally, to equip all our trucks with it."

Though no new units with the improved suspension have as yet been added to the Ebling installation, Mr. Mehlhop recently confirmed in person the estimate of its practical value contained in his letter of fourteen months ago. By "halves" is understood half-barrels of beer, each weighing 200 lb. The load carried on truck "76," which is the one shown in the accompanying halftone illustration, has thus become regularly 6 to 6½ tons instead of 5 tons, and occasionally, it is stated, it carries 6 8/10 tons, which is the limit of its volume capacity in half-barrels. Another 5-ton Mack truck, "75," originally similar in all respects, but not provided with the new suspension, is only allowed to carry a maximum of 5 6/10 tons, in view of the company's accumulated experience with regard to tire wear and repairs of the whole truck mechanism. As in the brewery trade it is reckoned that a rated 6½-ton truck, where it can be used to advantage in the routing of the vehicles, has a 30 per cent higher earning capacity than a 5-ton truck, with only a 10 per cent higher operating cost, the economical importance of improved spring suspension is strikingly illustrated in the present instance, since here, according to the testimony of the truck operators, the improved suspension has brought about the higher loading and earning capacity, while the operating and general upkeep cost is reduced, instead of being increased 10 per cent.

As the Williams system in truck "76" adds rather more than 1000 lb. to the weight of the vehicle, the upkeep economy is so much more surprising. The empty truck originally weighed about 5 tons and carried 5

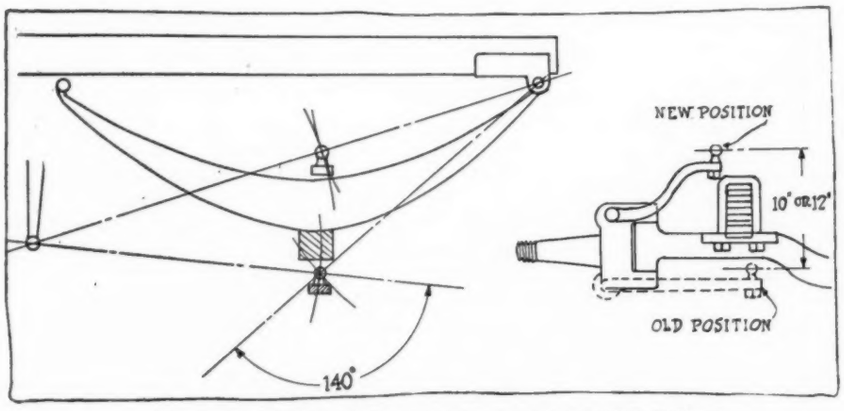


Fig. 3—Illustrating changes made in original steering linkage

tons. With the addition of ½ ton to its weight it carries 1 ton more of useful load. While the added weight cannot be looked upon as an advantage, it may thus be said, as the designer suggests, that the new suspension feature does twice as good work in the matter of carrying loads as the original construction. All the four Mack trucks among which the comparison is established are, however, from 1910 and have all been in brewery service since that year. No. 76 has been operated with the Williams suspension about three years.

Some notes with regard to the earlier stages of the Williams suspension are of interest, showing the growth of the idea and the modifications which have been found desirable. They are here given substantially in the words of Mr. Williams and upon his authority.

Earlier Installations

"The initial truck installation, which was necessarily crude, was applied to a 5-ton Low Cab Mack truck, "79," replacing another special suspension, and remained thereon about three years. This construction, which is not now followed, practically entirely obviated friction for the whole range of helical spring action when the truck stood on a level. The pressure of the little finger would set the front end of the truck in vertical motion, and a stronger finger would do the same at the rear. Four helical springs were used in front.

"After reconstruction, a rear arrangement similar to that on High Cab "76" was installed, but installation of the improved front suspension, with only two helicals, has been deferred, owing to construction difficulties with this type of truck.

"I was forced, however, to correct in "79" certain peculiarities in the steering gear design, which became defects and very noticeable with the mounting of the helicals and the higher flexibility (and which have also been changed in later Mack output)."

The changes made are illustrated in Fig. 3.

"Thereafter the only steering defect in "79" was the difficulty experienced in bad going and in turning wheels when going slowly or at a standstill. This was due entirely to decreased leverage, enforced by the limitations incidental to the change of design. In explanation of the sketch (Fig. 3) I will state that, on looking over a layout of the original front construction of the Low Cab, I find that a 2-in. deflection of the leaf spring produces a horizontal movement of the knuckle-arm ball-end toward the steering-arm ball-end of 1 7/16 in. Evidently, very little action was demanded of the springs. The relation of the three points—steering-arm ball-end, knuckle-arm ball-end and front spring eye—formed an angle of, roughly, 140 deg.

"In the reconstruction the right and left knuckles were exchanged and inverted, and the knuckle-arm ball-end was raised to a point in a straight line with the front spring eye and the steering-arm ball-end. The difference in height of the old and new positions was from 10 to 12 in.

"On the other hand, the somewhat similar action on High Cab "76," to accommodate the entire action of both leaf and helical springs, is about 1/16 in., or less than the play in the gear."

Applications to Pleasure Cars

The very first application which Mr. Williams made of his system for a spring suspension, before it had been developed to its present form, was to a Panhard landaulet to which semi-solid tires had been fitted on the rear wheels, taking the place of 5-in. pneumatics, in the hope of reducing tire expense.

At present he contemplates to apply the improved system to pleasure cars in the form which, so far as the front springing is concerned, is indicated in Fig. 4, while the rear suspension, it is understood, may take either a similar appearance or be patterned more closely after that used for the Ebling trucks.

Conclusions

In reviewing this account it cannot but occur to the reflecting mind that, in order to reach final conclusions, it would be desirable to compare the practical efficacy of the Williams suspension with that of other suspensions in 1915 or 1916 trucks, and to have the comparison of operating and upkeep cost accompanied by such definite data on the tire equipment, repairs and gasoline consumption for each of the compared vehicles as would establish an indubitable equality in the test conditions on the most essential points. Notwithstanding these reservations which may be called academic, as equality of conditions is never maintained for a couple of years in truck practice, or duly recorded, and a margin is always left for surmise on one point or another—it may be said that the Williams suspension makes out an excellent case for High Flexibility plus Stability by Special Means, and presents a realization of such special means which is extremely interesting and worthy of the closest investigation in theory as well as in practice; for pleasure cars, where the construction can be much lighter, as well as for trucks.

Data for Comparison of the Flexibility of the Williams Suspension and the Original Spring Equipment in Two Types of Trucks, the Working Results with Both Suspensions in Both Types Being Known

(All Measurements by Mr. W. R. Williams)

	Notes on Equipment	Vehicle Weight	Load Distribution	Deflection Under Load, in Inches, Measured at Axle						
				Load	Leaf		Helical		Total	
					Front	Rear	Front	Rear	Front	Rear
"78" 5-ton Low Cab (unchanged)	Platform and "helper" or overload spring on rear end.	About 5 tons	1 to 9 on front and rear	5 tons	3/16	2 1/4	....	....	3/16	2 1/4
"79" 5-ton Low Cab with Williams Suspension	New rear semi-elliptic leaf springs. Four helical springs at front, each of flexibility 100 lb. per inch, 4-inch coil diameter, 12 inches long, 7/8 inch round steel. Two helical springs at rear, each of flexibility 650 lb. per inch, 8-inch coil diameter, 15 1/2 inches long, 1 inch round steel.	About 5½ tons	1 to 9 on front and rear axles	Body only	....	....	1 1/4	1 1/4	....	....
				5 tons	1 3/32	2 1/4	1 13/32	1 1/4	1 11/32	4 1/2
				Reserve	....	....	3/32	1/16	....	....
				Maximum			3	3 1/4		
"75" 5-ton High Cab (unchanged)	Platform spring on rear end	About 5 tons	1 to 3 on front and rear axles	5 tons	3/4	3 1/2	....	....	3/4	3 1/2
"76" 5-ton High Cab with Williams Suspension	All 4 original leaf springs reinforced with 2 additional leaves. Original rear axle replaced by heavier one. Two helical springs at front, each of flexibility 360 lb. per inch, 6-inch coil diameter, 12 inches long, 3/4 inch round steel. Two helical springs at rear, each of flexibility 680 lb. per inch, 8 3/4 inch coil diameter, 15 1/2 inches long, 1 1/16 inch round steel.	About 5½ tons	1 to 3 on front and rear axles	Body only	....	....	1 1/16	0.64	....	....
				6½ tons	1 3/32	1.47	1 1/4	2.03	2 3/32	3½
				Reserve	....	....	1/16	0.77	....	....
				Maximum			3	3.44		

NOTE:—Leaf spring reserve remains after helical maximum is passed. NOTE:—Actual deflections of the helical springs are about double those measured at axle.

Detroiter Six Has Cable Brakes

Simple Chassis with Continental Engine Latest Detroiter Model

THE new Detroiter Six-45 is the latest model of the Detroiter Motor Car Co., Detroit. Built upon a chassis of 118 in. wheelbase, this six utilizes the slanting frame, the unit attachment of motor and gearbox and the Hotchkiss type of drive through the semi-elliptic rear springs, which are hung under the axle. The motor is a standard Continental block-cast type with the cylinder head detachable.

Cylinders are 3¼ by 4½ in., giving 25.39 hp. by the N. A. C. C. rating, although the power is said to come to 38 on the block at 2000 r.p.m. The displacement is 223.95 cu. in., and the stroke-bore ratio 1.38. The cylinders and upper half of the crankcase are cast in one piece, valves are on the right and, of course, completely housed in, but the carbureter is bolted high on the left center of the casting, so as to make it easy to get at and simplifying the control. Nothing else is placed on the left except the starting motor and the breather and oil gage. On the right are the exhaust manifold, the generator and the water pump.

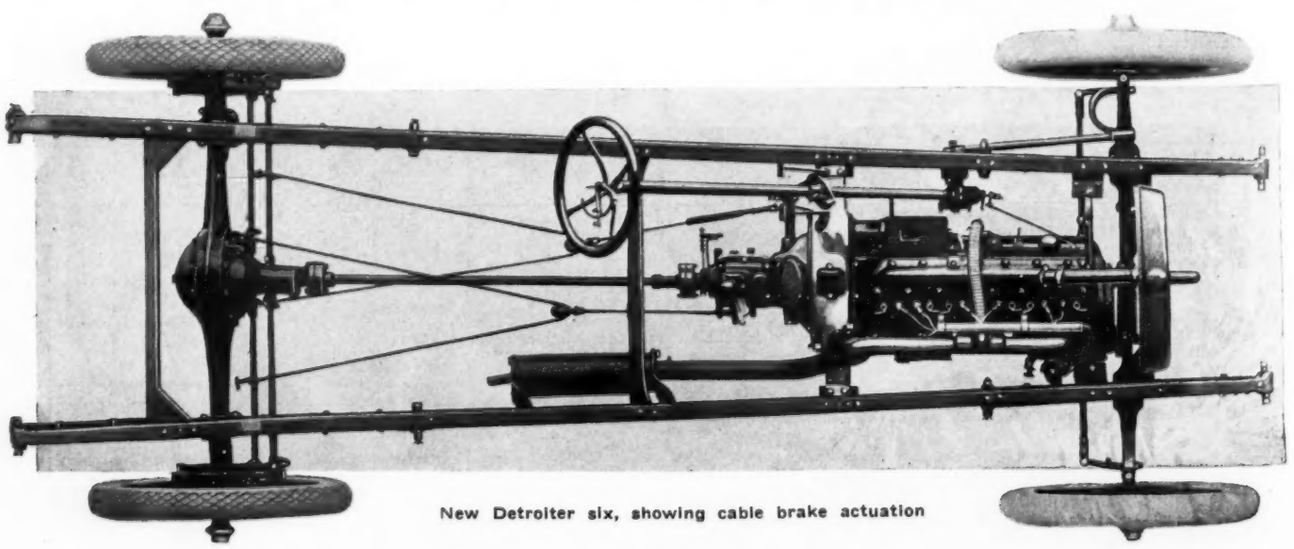
Auto-Lite Equipment Fitted

The Ball carbureter is used, and the fuel is drawn from an 18-gal. tank suspended at the rear of the chassis and delivered by the Stewart vacuum feed apparatus. Connecticut battery ignition is another feature, the distributer being mounted on the right forward side of the engine. Auto-Lite starting and lighting have also been well-applied, the starting unit hugging close to the flywheel housing on the left and connecting to the flywheel teeth by the Bendix scheme for automatically meshing and demeshing. The generator is driven off the end of the centrifugal pump shaft through a coupling that is designed for silence at all times. The electric system is of the single wire type with grounded return circuit.

From the figure mentioned above, it will be noted that this engine is of the moderately high-speed type, and throughout the internal construction this idea has been carried out by balancing the rotating and reciprocating parts and making them as light as possible for the work they have to do. The crankshaft is a three-bearing type that has 2½ in. main bearings and 2¼ in. crank-pins. The rods are long and drop-forged from 0.35 carbon steel and they attach to light iron pistons that are fitted with two rings each. In the valve system, the passages have been made of a generous size to prevent any restriction of gas flow, as is evidenced by the valves having a clear opening of 1⅝ in. They are made with nickel-steel heads welded to stems of carbon steel. Timing gears are helically cut, and the timing gear is made of specially prepared silk to insure quiet operation—a refinement that has been very quietly developed by motor engineers and which does much for the cause of silent motor operation.

Clutch and gearset assembly are compactly arranged to bolt to the flywheel housing by a regular form of bell construction, and they are designed in conformity with good and conservative practice. Five driving steel plates and six driven plates that are faced with Raybestos make up the clutch assembly, which requires no lubrication save at the bearings. The gears have a ¾-in. face, and are made of crucible nickel steel, case-hardened, heat-treated and ground.

It is doubtful if greater simplicity could be worked out in the construction of the chassis back of the power unit than has been found possible in this Detroiter. This is especially due to the elimination of either a torsion tube or torque rod by the use of the Hotchkiss drive. Thus simply a plain drive shaft, fitted with a universal at either end, spans the distance from gearbox to rear axle. Even the conventional brake equalizers are absent, a unique adaptation of pulleys and steel cables taking their place. The top view of the chassis will show this feature clearly. Running part way back from the foot brake and hand lever are two rods that terminate at pulleys through which the steel cable passes. The ends of the cable attach to the levers on the brake-operating rods that are attached to the axle housing. Pressure on the brake control, therefore, is transferred through the rod to the pulley, and thence delivered equally through the cable to the service or emergency pair of brakes, as the case may be. This is about as simple as a braking system could be made, and yet it is strong and positive in its action and should be noiseless. Needless to say, there is an adjustment in both sets of

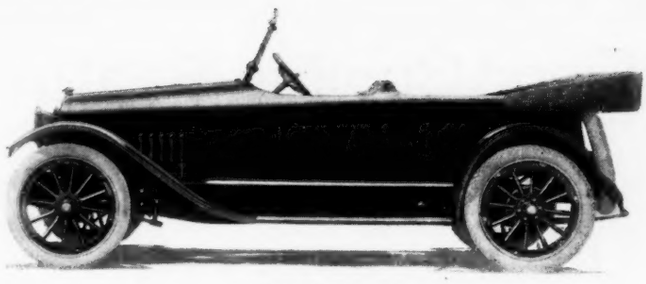


New Detroiter six, showing cable brake actuation

brake connections to take up any slack in the cables. The brake drums are 12 in. in diameter and have a 2⅝-in. face.

Springs Are Extra Long

A pressed-steel housing, ribbed at top and bottom externally, is used in the construction of the floating rear axle. The axle gears are of the spirally-cut variety now so universally used, and the whole differential unit operates on ball bearings, with roller bearings in the wheels. The rear cover is made as large as possible, so that it is easy to get at the gears for adjustment or other purposes. In order to be amply strong, especially in the case of the rear set which has to take the drive and torque, the springs are made of chrome-vanadium steel. Riding qualities are fostered by making them long and flat, the rear pair measuring 52½ in. and the front 36 in. The rear pair are substantially hinged to frame brackets at the front end, and are shackled at the rear to the bent-down back ends of the side members of the frame. Although underslung from the rear axle, the car nevertheless has a road clearance of 10 in.



Detroiter Six-45

At the present time, only the five-passenger touring body is offered, and it carries complete appointments and equipment in every respect. The upholstery is leather, and the tires are 33 by 4 in. all around, the rear set being of the non-skid variety. Special fittings, such as a tonneau windshield, Motometer or wire wheels, can also be furnished, though at extra cost.

Exhaust Turbine Drives Generator

WHAT may prove to be a valuable development and a new use for the wasted exhaust pressure, is the turbine operated generator. The turbine is driven from the exhaust gas. The idea was suggested to two employees of the Old Dominion Copper Co., Phoenix, Ariz., Charles W. Shepard and Harry W. Payne. The copper smelter is illuminated by a generator driven by a turbine which secures its power from exhaust steam.

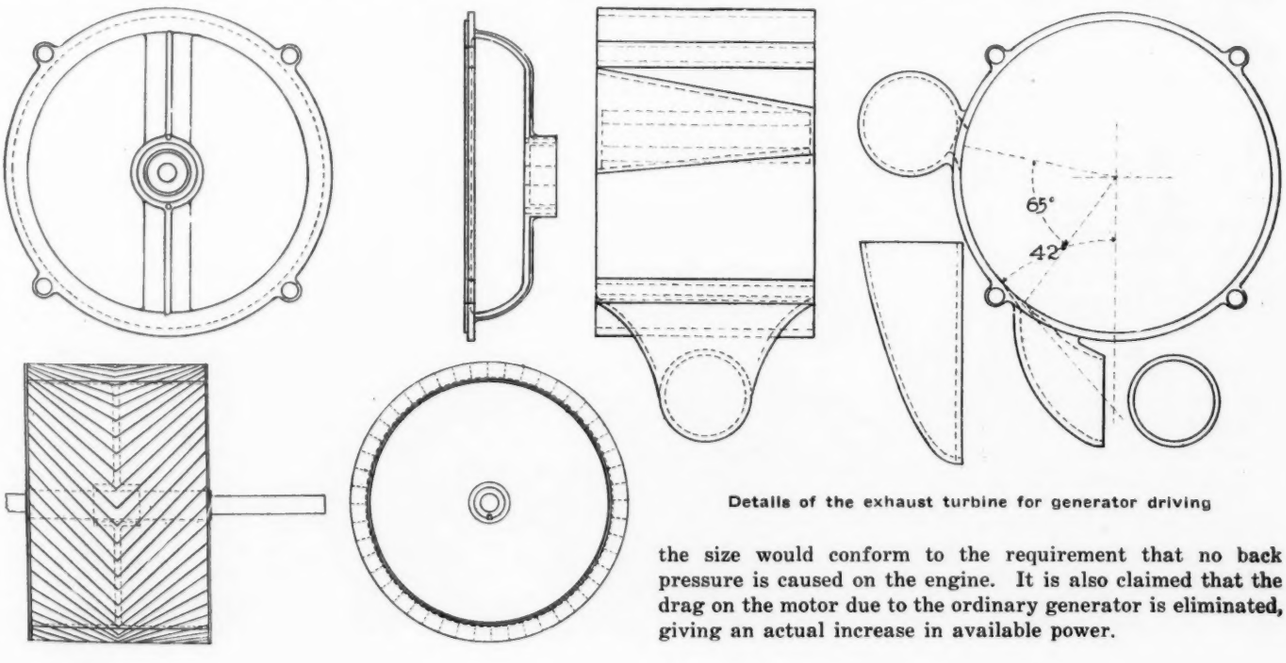
In converting this idea to one which will be practical in automobile usage, it is the plan of the inventors, who have taken out a patent covering the idea, to do away with the muffler. The turbine in its present form weighs eight pounds, being made from aluminum, and is comparatively inexpensive.

The inventors state that the turbine has not as yet been perfected, but that they are actively engaged on the device. The patent was taken out after it was seen that such a machine may develop into a practical attachment. The illustrations herewith show the device in its latest form. It will be noted that the turbine wheel bearings are on a projection from the head of the casing, thereby avoiding the bad effects of direct heat.

The turbine wheel has the vanes set at a 90 degree angle, the object being that the exhaust from the engine enters the casing on a line parallel to the shaft and at all times five blades are receiving the force of the flow, retaining it for 65 degrees or over one-sixth revolution.

The drawings shown were prepared to make the installation on a Ford car, and the device is to be placed on the left side of the engine, under the hood. From the experiments noted, it would seem that the generator would be geared about 1 to 3 to the turbine. In experiments made so far the inventors claim to have driven the turbine at 1200 r.p.m. while the engine was idling and with plain bearings on the turbine. It is planned to use a centrifugal governor on a cut-out if too much speed is developed, although this and other details are to be the subject of further experiment.

On the present device the nozzle through which the gas enters the casing is ⅛ in. wide, this size being used so that



Details of the exhaust turbine for generator driving

the size would conform to the requirement that no back pressure is caused on the engine. It is also claimed that the drag on the motor due to the ordinary generator is eliminated, giving an actual increase in available power.

Good Cooling Features New Rotary Valve

Kline Patent Discloses Some New Ideas in Rotary Valve Construction

OF the great multitude of rotary valve motor patents, that just granted to H. J. Kline appears to be one of the most promising that has been seen for some time. In designing a rotary valve the problem to be mastered is to keep the valve gas-tight and properly lubricated, to compensate for wear and to prevent dirt and foreign matter that would score the valve and its bearings from coming in contact with these parts. It is also necessary to keep the valve at as low a temperature as possible, at the same time holding the temperature constant for all loads and speeds, if such is possible. By this application the fit of the valve will not vary as much, nor will the lubricating oil carbonize and become gummy. It is also possible by this application to so construct the valve and its related parts that a minimum pressure will be exerted on the valve due to the force of the explosion. In short, the problem is to use what is commonly known as a balanced valve. This can be accomplished in part by limiting the exposed valve area to as small a surface as practical conditions will permit.

The Kline valve was designed to meet these requirements as far as possible. By using an automatic auxiliary exhaust valve, in conjunction with the main or rotary valve, the former, controlled by the piston, may be so designed that it will carry away a large part of the heat of the exhaust. At light loads, when the throttle is slightly open, the exhaust pressures within the cylinder are such that the automatic valve is supposed barely to lift. At full loads, where the exhaust pressure is very high, the valve should be forced wide open, so that the larger part of the exhaust gases and consequently the major portion of the heat, would be carried out at the lower end of the cylinder. Thus the heat carried past the main or rotary valve would be more or less uniform and the temperature be practically constant for all loads. If this is so, the expansion of the valve should vary its size but little.

It is also a necessary deduction from these facts, that temperature will be lower. This condition is conducive to proper maintenance and life of the moving parts.

There are several factors that assist in maintaining a low-operating temperature of the valve and its bearings, aside from the auxiliary exhaust. One is the proximity of the intake manifold, which will absorb a great deal of heat. A second is the fact that the valve is hollow and may be either water- or air-cooled, and the third is the full water circulation around the valve casing.

In order to secure a proper fit of the valve and to maintain a gas-tight joint after some wear has occurred, a further problem arises. The location of the exhaust and inlet manifolds in respect to the valve is one of the factors in keeping the valve tight. The Kline valve rotates *toward* the cylinder, so that when pressure is applied, by way of the ports leading to the combustion chambers, the valve will be forced against the opposite side of its casing.

The inventor claims that, as the valve rotates under this pressure, it tends to pivot or roll toward the cylinder, and keeps this side sufficiently tight to form a gas-tight joint.

Packing Only a Safeguard

When the valve is new, it should be so tight that packing would be unnecessary, providing, of course, that the fit is quite close and the valve temperature will not vary to any great extent above or below the normal operating condition. To compensate for the wear of the valve, there are packing rings and a packing strip. This strip bears on the rings, so that when new, it will not touch the valve at all, simply conforming to the bore of the casing.

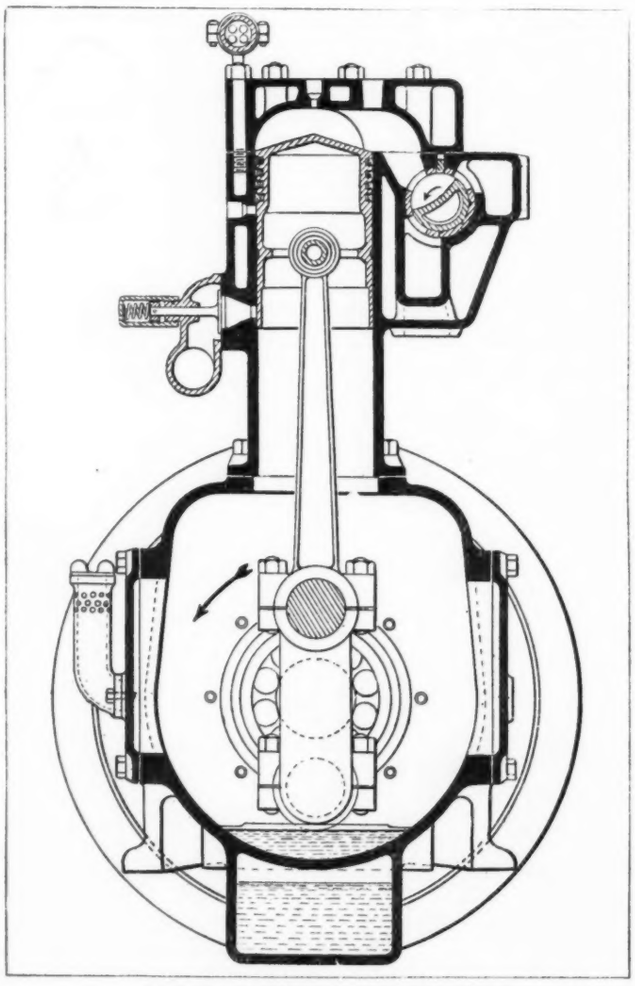


Diagram of Kline rotary valve engine

The packing rings do not revolve with the valve, but creep slowly around, due to the cylinder pressure forcing them against the side of the grooves in the valve. This creeping action, it is claimed, will slowly wear the ends of the packing strip so that it will gradually settle as the valve wears and will still continue to keep this point sufficiently tight.

Lubrication of the valve is accomplished by forcing oil to the bearing surfaces between the cylinders, inclosed by the packing rings. The oil film thus created is expected to carry the valve so that the portion opposite each cylinder will bear but very little load. Theoretically, these portions are free of the bore.

The oil is fed from a duct above the valve, and after flowing around the bearings, is gradually drained out at the bottom by another duct below the valve, which carries it back to the original source of supply.

Kerosene Engine of Simple Design

Duplex Exhaust and Intake Manifold Employed for Fuel Vaporization

THE Field Motor Co. of Grand Rapids, Mich., has begun the manufacture of an engine different from any other type on the market. It is a horizontal motor, directly opposed, and it is said to run on gasoline, kerosene and distillates. It has but two cranks and two connecting-rods for four pistons which gives such a compactness of construction that it occupies a space only of 11 by 23 by 14 in.

The pistons and the tie rods are made from one piece of steel, the tie rods being flush on the crankshaft, although permitting plenty of space for operation. This gives practically a continuous piston from side to side. The tie rods which connect the pistons have sliding fits on each side of the crank webs and also on the top and bottom of each crankshaft bearing.

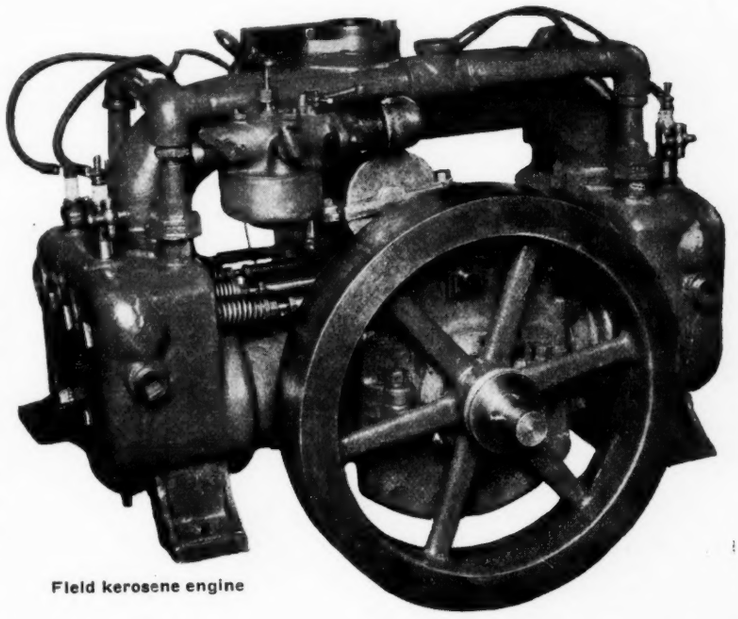
Uses Any Carbureter

Any standard carbureter may be used with the Field motor. The secret of its success in burning low-grade fuel is the fact that all charges are preheated. The carbureter, unlike all other engines, is above the cylinders and the charges gravitate down to the manifold. One manifold supplies all cylinders and it is so arranged that the exhaust heat affects the charges from the carbureter preparing them for a perfect explosion in the cylinders. The arrangement of surfaces and valves controlling the exhaust has not been patented.

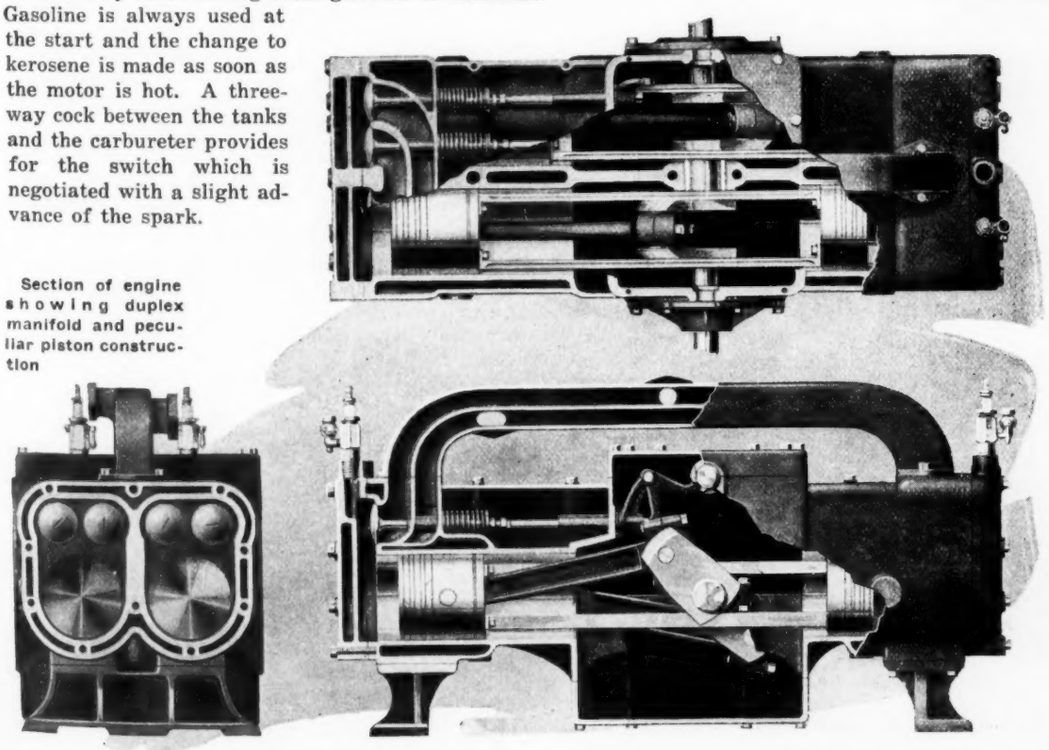
It is claimed that no adjustment of the carbureter is necessary in switching from gasoline to kerosene. Gasoline is always used at the start and the change to kerosene is made as soon as the motor is hot. A three-way cock between the tanks and the carbureter provides for the switch which is negotiated with a slight advance of the spark.

Because of the compact style of construction the motor consumes but very little space and is claimed to be adaptable to airship use. Its simple construction also makes it adaptable to tractors and motorboats. But three operations are necessary to expose the interior of the engine, and it can be held in position with four bolts to the frame. The accessibility is one of the cardinal features. The motor is block-cast with removable heads, the cylinders being bored in line, with one boring bar. The ends are milled and squared at the same operation. All parts are inclosed. With the pistons carrying the connecting-rods lubrication of the wrist-pins is excellent.

A set of inclosed spiral gears operate the camshaft and magneto. An adaptable governor, attached by a simple operation, will permit the engine to be used for stationary purposes.



Field kerosene engine



Section of engine showing duplex manifold and peculiar piston construction

The Sizes of Motors for Trucks and Outline of British Practice in This Field

By W. D. Williamson

Part 2—Outline of British Truck Motor Design

(*Continued from page 477, issue of March 9*)

CRANKSHAFT BEARINGS—In several engines of the three-bearing type the middle bearing is the same size as the big ends, and this may offer manufacturing advantages and seems to be satisfactory in service. In the way of standardization and reduction of spare parts, some makers also have the front bearing of the same dimensions. The average lengths, however, for the three bearings, taking the length of the connecting-rod big end bearing as 1, are 1.21 for the front, 1.17 for the middle, and 1.48 for the rear.

Setting down average surfaces as found from the engines examined, where D = cylinder diameter, we have:

Big end:—Average pressure, 765 lb.
Big end area = piston area, 2.73
Diameter of crank pin = $0.4\,D + \frac{1}{4}$ in.
Gudgeon pin:—Average pressure, 2100 lb.;
Gudgeon pin area = D^2: 9.6
Diameter of piston pin = big-end diameter — 1 1/32 in.

Main bearings have the same diameters as the crank pin, and the lengths are respectively 1.21, 1.17 and 1.48 times the crank pin length.

These dimensions are put forward, not as being the ideal, but as representing current practice as shown by the engines of which the requisite data were available.

Only two prominent builders of commercial vehicle engines use ball journal bearings for the crankshaft, as in Fig. 7.

Valves and Valve Setting

With the exception of the Daimler vehicles, all British commercial vehicles have engines of the poppet valve type. These valves are usually of 3 per cent or 3.5 per cent nickel steel with seats at 45 degrees. The London General Omnibus Company, after experimenting with other materials, standardized mild steel valves suitably case-hardened and ground to overcome the difficulty of wear in the stems. Where trouble has arisen due to excessive wear or pitting of the face, nickel chrome steel has been used with advantage, while one maker has found a remedy in a return to cast-iron heads.

Examination of a number of engines showed an average of:

Opening in valve seat = 0.46 cylinder diameter.
Valve lift = cylinder diameter: 12
Effective area of valve opening = cylinder area: 10

Valve tappets adjustable by set screws at the upper end and fitted with rollers at the lower end are standard. Figs. 8, 9 and 10 show care to insure ample wearing surface in the tappet guides with tappets as light as possible.

The average taken over a number of valve settings is shown as a diagram in Fig. 11.

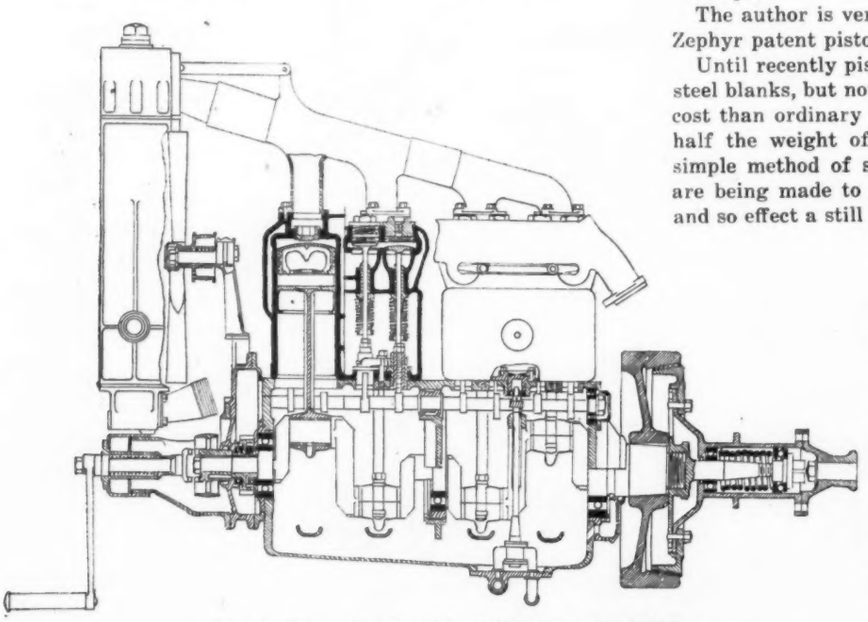


Fig. 7—Commer Car with ball-bearing crankshaft

Pistons

Except in one or two cases, no great effort has been made for obtaining very light pistons. General practice favors three rings above the gudgeon pin. The Dorman engine is a notable exception, being fitted with a special type of compound ring which gives excellent results. The usual method of securing the gudgeon pin is by one set screw, which must be securely locked. Where two set screws are used for this purpose, it is found difficult, even by the use of jigs, to insure that the holes in the gudgeon pin and bosses are drilled exactly the same distance apart, and the smallest error may cause piston distortion. Two or three makers use a ring for retaining the gudgeon pin, and also use a fifth ring acting as a scraper.

The author is very strongly impressed by the claims of the Zephyr patent piston shown in Fig. 12.

Until recently pistons of this design were turned from solid steel blanks, but now they are made in cast iron at no greater cost than ordinary pistons. Pistons of this design are about half the weight of the ordinary type and allow of a very simple method of securing the gudgeon pin. Arrangements are being made to produce these pistons in aluminium alloy and so effect a still greater saving in weight.

Lubrication

Some form of pump for oil circulation is practically always fitted. The type most in favor is the gear pump, which answers the purpose extremely well for oil, although not so successful when, as in the past, it is used for circulating jacket water. Oil is usually fed under pressure to the main bearings and through the crankshaft to the connecting-rod bearings. Cylinder walls and gudgeon pins are lubricated by splash. Excess oil is directed to the timing gears in the Dorman.

The ideal would appear to be some combination of a forced system with the

trough system as used in Daimler engines, the two systems being independent, so that in case the forced system fails the bearings are not endangered. There should be no ill results due to the increased supply of oil, so long as efficient means are provided to prevent over-lubrication of the piston.

The Wolseley has a notable arrangement of oil collecting galleries, and the Albion (Fig. 8) has thrower rings arranged on the crank webs for the lubrication of the big ends.

More consideration might be given in many cases to the position of the crank chamber filling orifice. It should allow of a large tin being up-ended over it without fouling other parts and without wasting oil. It should be provided with a filter.

In Wolseley and Leyland engines these points have received attention. In the Dorman the oil is introduced through the top of the fan bracket. (See Fig. 18).

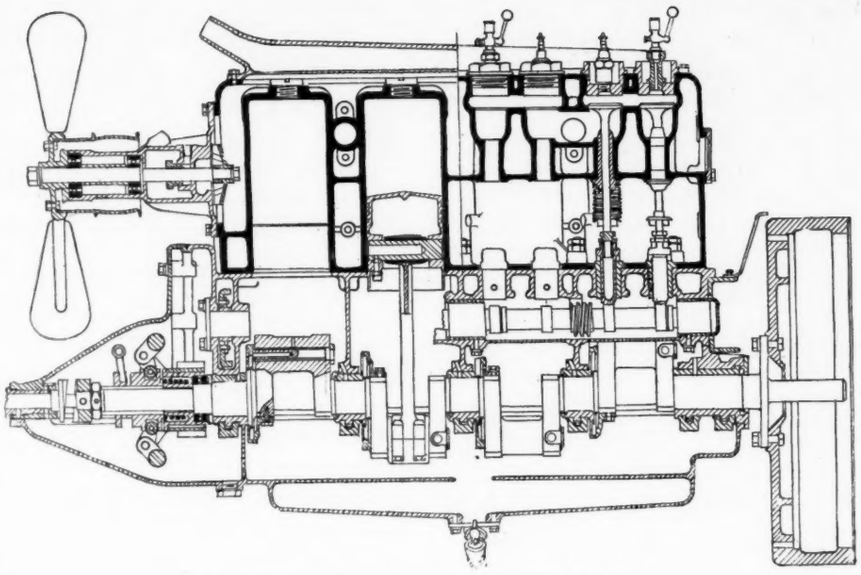


Fig. 8—Albion truck motor, lubrication notable

Drive for Timing Gears

With a few exceptions, notably the London General Omnibus "B" type (Fig. 13) and the White and Poppe (Fig. 10) fitted to Dennis lorries, poppet valves are arranged on one side. The chief disadvantage would appear to be that it necessitates somewhat small valves or gives greater overall length to the engines.

For the camshaft drive the usual practice is to have two helical gears of steel, the pinion being hardened and the wheel, to insure quiet running, being of a steel giving the requisite wearing properties without hardening.

In the larger motors these gears usually have teeth of 8 in. diametral pitch and 1¼ in. wide.

Silent chains are used in the Daimler (Fig. 14), Wolseley, and Tilling Stevens.

Belsize engines have ⅝ in. pitch roller chain drive, which appears to be quite satisfactory as regards both silence and life.

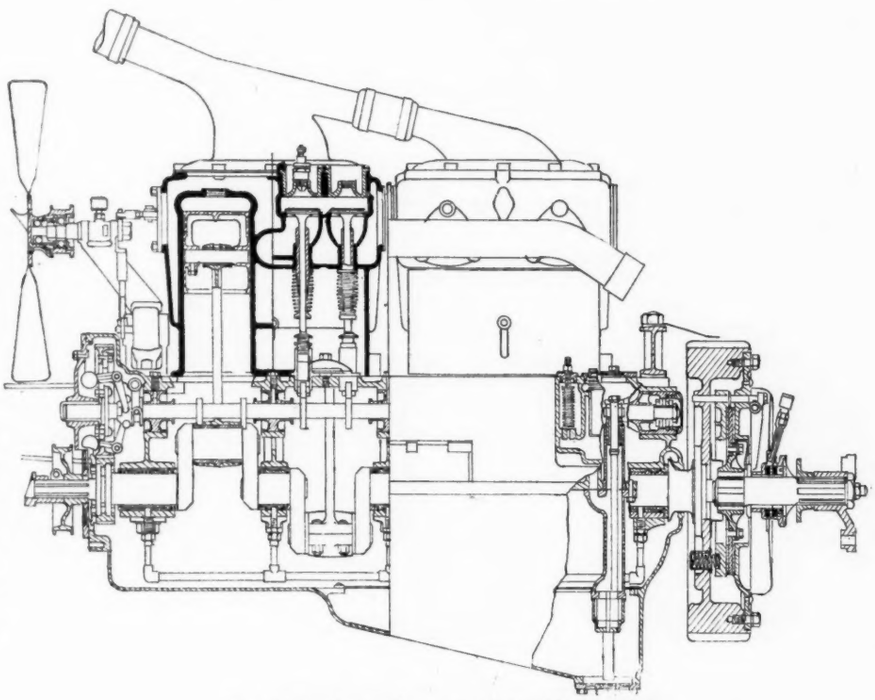


Fig. 9—Napier motor, a representative design

Drives for Pump and Magneto

Pumps should be easily accessible for repacking of the glands, and the contact breaker should be in such a position that it is not only accessible to the hands, but also so placed that the mechanism can be seen when the cover is removed.

These conditions are obtainable most readily by the fitting of a cross-shaft over the timing case.

In in the Pagefield arrangement (Fig. 15) this cross-shaft is set at an angle so that the pump is thrown down in line with the outlet from the radiator, and the contact breaker is lifted up to become quite the most accessible part when the bonnet is lifted. In this arrangement the angle of the helical gears is modified to allow of the spiral gear on the cross-shaft engaging with the wheel on the camshaft.

The Halley, Leyland, Tilling Stevens, Tylor and White and Poppe are other engines where the cross-shaft is adopted, and only one gland is required for the pump. The White and Poppe arrangement is shown in Fig. 16. The Napier (Fig. 9) and the Dorman are typical examples of the arrangement where pump and magneto are placed in line alongside the engine.

The Albion arrangement of pump drive (Fig. 8), where the cylinder jacket serves as the pump casing, is an entire departure from common practice, and possesses distinct advantages in the way of simplicity.

Governors

Whether or not a governor should be fitted has not been settled satisfactorily. In ordinary commercial service a governor should provide a means of insuring that the vehicle is not over-driven when light. On the other hand, a vehicle with a governed engine is not as nice to drive, the power of accelerating beyond normal speed in an emergency is absent, and gear changing is, perhaps, not quite so easy. The type of governor most popular with the ordinary driver seems to

be the one that is most easily put out of action.

It is difficult to arrange for the governor to combine accessibility with simplicity, but the Daimler (Fig. 14) and the Pagefield are worthy of note in this respect. The latter is entirely inclosed.

The practice followed in some cases of arranging the governor to act on the carbureter throttle valve is not calculated to give the best results in fuel consumption. In the case of a carbureter with a throttle valve shaped to give a rich mixture at very small openings, for easy starting, the throttle may assume this position on a favorable gradient at high engine revolutions, and the mixture taken into the cylinders may consequently be much too rich.

Half Compression and Starting Devices

The author is of the opinion that for the larger engines a simple arrangement for releasing compression for starting purposes is a decided advantage for lorries that are parked in the open or for vehicles, such as furniture removers' vans, that may have to stand for some hours in the coldest weather. If it becomes necessary to have female drivers for the heaviest vehicles, anything that helps to ease matters for them will find favor, and it may be that the self-starter proper will find advocates. For the present, the fitting of self-starters to commercial vehicles has not been attended with success. They have been tried with the idea of saving fuel by encouraging the driver to stop his engine at every halt, but the saving effected has not been all that was expected.

(To Be Continued)

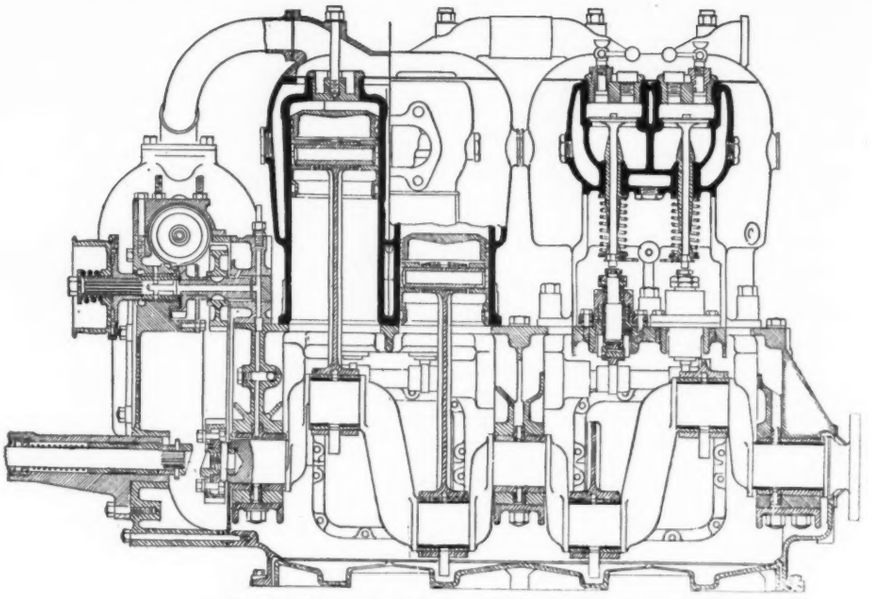


Fig. 10—White & Poppe engine, one of the few T designs

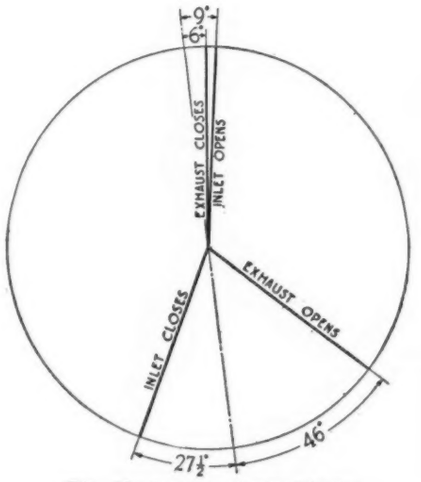


Fig. 11—Average Valve Timing

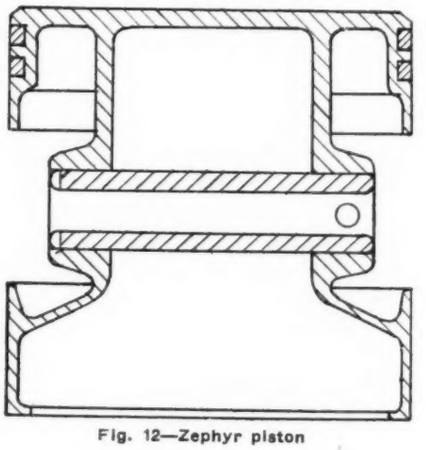
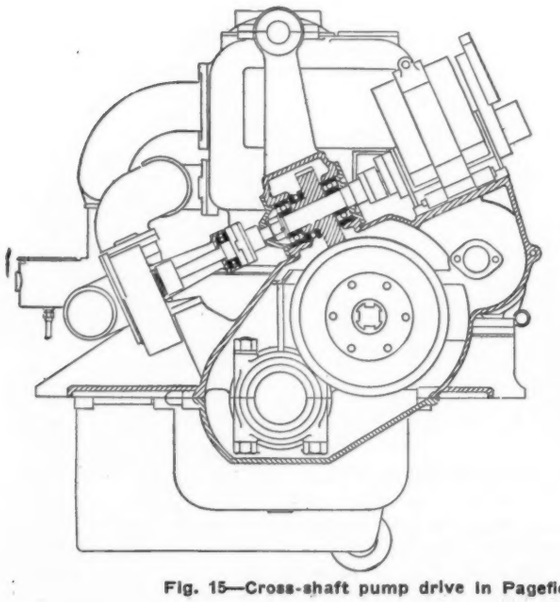


Fig. 12—Zephyr piston



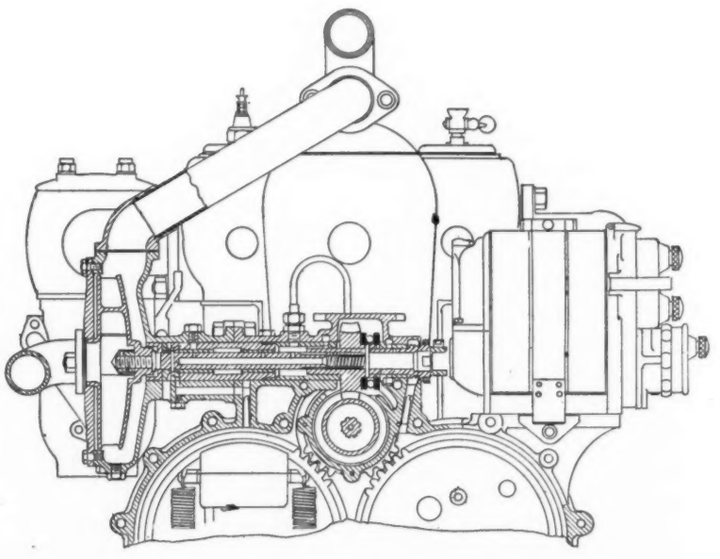


Fig. 15—Cross-shaft pump drive in Pagefield motor. Fig. 16—Cross-shaft drive in White & Poppe motor

The FORUM

DORT CAR NEAR IDEAL DIMENSIONS — STEERING WHEEL POSITION HIGHLY IMPORTANT — AN AMATEUR'S IDEAS OF COMFORT AND HOW THEY WORKED OUT

Dort Dimensions Close to Ideal

By E. Planche

(Chief Engineer Dort Motor Car Co.)

REGARDING the article by Mr. J. E. Schipper on the subject of body proportions to give comfort to the driver of ordinary height.

We have made a drawing of the body following the same lines of a sketch published in your estimable paper and besides the figures you recommend, we have put the figures that we have in our Dort car and in the third column the dimensions that we think would be the ideal from our own point of view.

You will please notice that for a small car the Dort comes very close to the measurements you recommend, and we must say that from our own experience in this car, when driving under all kinds of conditions of weather or road, we have found the sitting conditions for the driver very pleasing and not such as to place any undue strain on his nerves.

Thinks Steering Wheel Position Most Vital

By A. A. Bateman

(Jackson Automobile Co.)

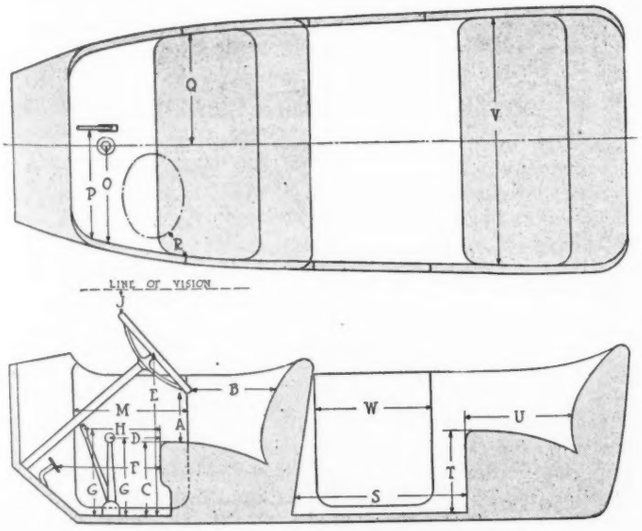
I WISH to compliment Mr. Schipper on the able manner in which he has handled a very important subject. However, there are some points which I think are slightly overdrawn. For instance: the heading of the article "Driver's Lot 99 Per Cent Discomfort." This, no doubt, is to attract attention to the article. It certainly is not intended as data from such a reliable source. I believe that the comfort and convenience of the driver has not been entirely neglected by the majority of designers. By careful survey of the hundreds of accessories that are made and applied to the automobile of to-day a very large per cent are designed with one purpose, namely, for the convenience and comfort of the driver.

Owners' Views Differ

Regarding the height of seat, steering gear, etc., also distance from the back of the seat to the steering gear, there are a great many things that have to be taken into consideration before a definite dimension can be used to satisfy even the average driver. The height of the seat, for instance.

I note that the dimensions on the car mentioned run from eleven to sixteen inches. Will venture to say that the manufacturers have been asked by purchasers to make their seat just a little higher than the highest and likewise some will want the seat lower than the lowest. This also applies to the height of the wheel at the distance from the back of the seat to the wheel.

I have noticed in a great many instances, and I think many who have made a like observation will agree with me that a car which has just the proper location of the wheel for any particular driver who, when sitting in his natural position, either erect or slightly reclining, will be in such a position that a line drawn at right angles of the column through the rim would intersect with the hip pockets of the driver and at a height when the driver's hand is on the center of the wheel the forearm will be on the same line. This, of course, would necessitate a greater or less distance from the back of the seat to the wheel, depending upon the size and build of the



Dort standard touring car dimensions

Dimensions of Standard Dort Touring Car

	Dort	Recommended by AUTOMOBILE	Recommended by Mr. Planche
A	8½	9	9
B	16	16	16
C	14½	14	14½
D	7¾	6	8
		Dort gives more room to pass by	
E	27½	27	27½
F	18	19	18½
G	16	19	17
H	None	12	10
		Dort foreign is 12	
J	5½	Over	Over 5½
K	No.	No	No
L	None	No	No
M	19½	19½	19½
N	Note	Note	..
O	17½	18	17½
P	None	20	21
Q	19½	18	20
R	10½	11	10½
S	25	27	25
T	14	14 to 17	14
U	19	21	20
V	45½	46	48
W	19½	21	19½

Note—Drivers not quite erect.
K—Must one lean to shift gears.
L—Must one lean to apply emergency.

driver. I think the greatest cause of fatigue after a long drive is due more to the unnatural position of the steering wheel than the shape of the seat or back.

As to position of the shifting levers, care must be taken not to get them too close as to interfere with the driver getting out of the right side of the car, as at least 50 per cent of the entrances are made from the curb.

Also the brake levers should be so placed in such a position that they will not be much back of an upright position, as thereon the angle becomes so great that very little power can be applied.

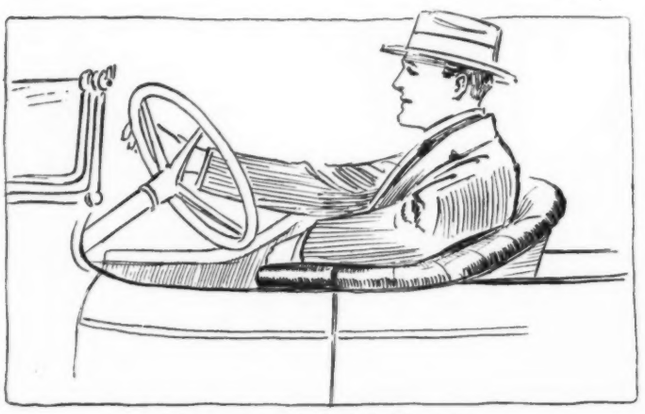
The possibility of establishing a limit for the location of a steering wheel is practical, but as to the location of the doors, shape of the back of the seat and the amount of room in the tonneau enters into each individual design. I believe the solving of this problem will eventually be adjustable driver's seat, both as to height and fore and aft. Also the steering gear and pedals so constructed that they may be easily changed to suit any particular driver.

How to Make a Stock Car Comfortable

By C. A. Du Bois

BEING an owner-driver, I have taken great interest in Mr. Schipper's article on Driver's Discomfort, in your issue of Feb. 3, and agree with him in his remarks. Would say in addition to his comments that I think that the proper height of the cushion should be from 13 to 15 in. from the floor for the average driver, or so that his feet should rest squarely on floor board. This height and position of feet gives him a chance to raise his body when taking bad spots in the road and relieves the strain on his back. It also makes it easier to leave seat, as you are not obliged to grab hold of steering wheel with one hand and pull yourself up at the same time giving yourself a push with the other hand on back of seat. In entering you do not have to drop into seat. If this were not true why did not the wagons and carriages of the past have their seats as low as 6 or 8 in. as they had the advantage of easier springs. I find that the driver in most cases when he has a guest sitting by his side is obliged to leave car on driver's side, as very seldom do you see guest leave car before the driver; as levers are in the way it is doubly hard to leave car and climb over guest, therefore, it does not make much difference whether levers are bent or offset.

Last year I had a demonstration of three cars of the $1,100 to $1,300 class with the intention of buying, and after driving all three purchased the one that was most comfortable in regard to height of cushion from floor, although the other two cars had better engines. On both of the rejected cars I could not drive over rough roads without hitting the steering wheel.



C. A. Du Bois' padded door edge

Changes That Made Comfort

While the car I purchased was not all that I desired in comfort, I immediately started in to make it so. I placed on the front doors of the car 8 by 2-in. cushions to correspond with the upholstery of the arms or side of the car in the rear. My idea in doing this was because the end of the upholstery came where I naturally would rest my left elbow. As far as appearances go it is not noticed except when door is left open. Next I placed a sliding steering wheel on the car, which gave me 16 in. between the steering post and the edge of door frame to enter car. When wheel is open it gives me an opportunity to enter the car in a standing position and adjust my clothes before sitting.

When changing gears I had to lean forward about 12 in. to go into second speed, and when I did I usually hit my knuckles on the bottom of the dash cowl. To eliminate this I made a 3½-in. offset extension of 4-in. on the gear lever that gives me now an opportunity to make changes with very little motion and very much easier as on account of the extra leverage I can change by using thumb and finger only. I placed extensions on foot pedals of 3 in. and made a foot throttle that fastened on side of gear lever box that has a side motion rather than the up and down or button kind. Was unable to reach with comfort the throttle that was fitted to the car originally.

This side motion throttle has the added advantage of smoother action when riding over bad spots and quicker acceleration and gear changing as the throttle is at side of you, when in natural position, on floor of car.

Am now making a driver's cushion that slides on a frame so that when in right position can be clamped in place. The cushion at driver's back is to be separate and fastened at bottom on hinges that are adjustable forward 3 in. and up or down 3 in., the space at top being inclosed in the bellows type of upholstery, so that it would not interfere with lines and appearances of car.

A Lazy Man's Ideal

By making these changes you see I have the ideal lazy man's car and at the end of a day's run am not fatigued as I would be if I were using a car in the condition that it was when purchased. I think that the future ideal car will have two doors only, one wide door at driver's side and an ordinary door on opposite side in rear, giving the tonneau passengers an opportunity to enter at curb. The front seats to be divided with 10-in. passageway and driver's seat and back to be adjustable. With this arrangement you have less door rattle and it is possible for driver to enter at curb.

McIntyre Axle Resists Side Shocks

With reference to the description of my front axle in THE AUTOMOBILE for Jan. 27, you have not given this device full credit, as I notice that you have made the statement that no road shocks barring a glancing blow will deflect the steering. You have cut out the best portion as this device is especially designed to take care of the glancing blow from the unevenness of the road, such as getting out of car tracks and ruts in the road.

For your information will say that one of the tests made with this axle is that you can drive the car, say, at an angle of 45 deg. so that when the front wheel is about to strike the curbstone or a similar obstruction, you can let go of the steering wheel and the car will mount over it. The same applies to striking an unexpected obstruction on the road; the steering wheel will not be jerked out of the driver's hand as there are no shocks transmitted to the steering wheel in either case.

ELMER E. MCINTYRE.

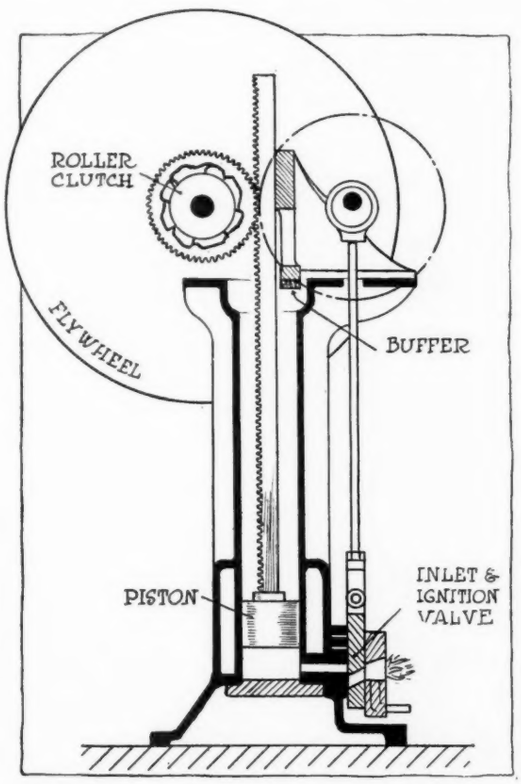
The History of the American Automobile Industry—21

Langen and Otto's Experiments with an Engine Having a Free Piston—Working Stroke Atmospheric and Power of Explosion Only Partly Utilized—Noise and Vibration Were Troubles

By David Beecroft

WITH the last two instalments of this history the work of Stuart Perry in America and Lenoir in France was reviewed. Both these inventors took the steam engine as their model, to a considerable extent, and tried so to alter it that it would operate with a different working medium. Coming to more recent years we see a notable change, in that the steam engine type was largely abandoned and totally new constructions made the subject of endeavor.

Within the next half-dozen years, after Lenoir's first patent, a half-dozen gas engine inventors appeared. Siemens and Hugon patented engines using platinum ignition the same year, 1860. W. E. Newton in a British patent of 1861 describes an engine employing pressure, or compression, which he secured by a second cylinder and piston, much like a modern two-cycle, and using jump spark. F. H. Wenham in 1864 patented a free-piston engine, Hugon in 1865 an improved form with flame ignition, and following these Otto and Langen brought out their patent in 1866. This device was much better worked out than preceding ones, and more nearly in accordance with the theoretical requirements laid down by Rochas a few years before. The cylinder was vertical with admission valve at the bottom, and means for igniting when the piston was near the lower, or head, end of the cylinder. No exhaust valve was used, but the piston was freely permitted to rise on the exploded charge until it reached the top of the cylinder and the charge exhausted freely into the air. The piston at once fell back, and turned a shaft by a rack, pinion and ratchet. The condensation or cooling of the gases in the cylinder permitted the atmospheric pressure to drive the piston downward in addition to its own weight, and also introduced the new charge below it. When the piston had compressed the new charge enough to support its own weight, ignition again took place, and the action was repeated. These engines were very noisy because of the free exhaust, they caused considerable vibration, owing to the violence of the upward piston movement with no means for balancing or counteracting it, and while better than their predecessors, were still far from being perfect. A goodly number of them were made, however, and put on the market for public consumption.



Section of Otto and Langen engine with free piston. The explosion threw the piston to the top of the stroke, the rack revolving a free wheel clutch. Atmospheric pressure then drove the piston down again, the clutch gripping and turning the shaft

A non-compression engine using flame ignition was patented by W. H. Laubach in January, 1868, and there was some activity in engines of this type about this time, largely because of the introduction of petroleum following the boring of the first, or Drake, oil well in 1859. In July, 1868, B. T. Babbitt, since celebrated as a soap magnate, patented a multi-cylinder engine with electric ignition for compressing air, and in 1871 C. P. Leavitt was granted a patent on an engine of the Brayton type.

Other Patents

In 1854 and also in 1857 Barsanti and Mattenci took out English patents on a gas engine of the free-piston type in which they used electric ignition and a make-and-break mechanism with a storage coil or "multiplier" of the De la Rive type. The drawings of this ignition system are not very plain, but it seems to be a wipe spark secured by a revolving part.

Michigan's 1915 Registration Analyzed

Over 400 Car and Truck Manufacturers Represented

OVER 400 automobile and motor truck manufacturers are represented among the 112,953 passenger and commercial cars registered by residents of Michigan during 1915. The remaining 1892 vehicles reported in the total given by the Secretary of State are registered by residents of Canada, etc. They were included in his total because they are actually registered and in use in Michigan.

A great many of the cars found in this analysis of the registrations by Michigan people were built by manufacturers who have either failed, merged with other companies, or been absorbed. Included in the general total are 902 cars and trucks classed as miscellaneous since they are on record merely as "assembled," "own make," or under freak names.

Of the 112,953 vehicles registered, 111,177 are gasoline cars and trucks and only 1776, or less than 2 per cent are electrics. There are 108,102 American-built gasoline passenger cars and forty-three foreign cars. There are 3150 commercial vehicles, or less than 3 per cent of the total registration, 3032 being gasoline and 118 electrics.

In the analysis it is brought out that 44,113, or over 40 per cent of the 108,102 American-made gasoline passenger cars are Fords. Buick is second with 7749, then comes Overland with 7425, Studebaker with 5014, Reo with 4863, Maxwell 3218 and Cadillac with 2987.

Car	No.
Gasoline Passenger	
Abbott	387
Aerocar	15
Allen	44
Alpena	68
Alter	123
Anhut	21
Amplex	7
American	129
Apperson	74
Argo	43
Auburn	234
Aurora	1
Austin	26
Badger	2
Baines	1
Bates	2
Benham	6
Bergdoll	4
Bimel	2
Black Crow	2
Blomstrom	25
Briscoe	157
Brownell	1
Brush	624
Buick	7749
Busser	1
Cadillac	2987
Cameron	10
Campbell	1
Carhartt	21
Carnation	37
Cartercar	885
Case	104
Chalmers	1269
Chandler	145
Chevrolet	955
Clark	25
Clermont	1
Cleveland	7
Coey	1
Colby	1
Cole	291
Columbia	46
Cooley	1
Corbin	9
Cornelian	11
Courier	23
Crescent	10
Crow	146
Croxton	1
Cunningham	16
Cutting	240
Dalton	1
Davis	4
Dawson	1
Day	3
Dayton	8
Deal	6
Deere	1
De Luxe	2
Demot	20
De Tamble	30
Detroit-Chatham	5
Detroit-Dearborn	19
Detroiter	452
Diamond T	4
Dodge	1174
Dolson	7
Dort	132
Downing	2
Dragon	2
Elkhart	41
Elmore	162
E-M-F	1036
Empire	83
Enger	6
Everitt	140
Ewing	1
Fall	1
Firestone	1
Fisher	1
Flanders	132
Ford	44,113
Franklin	245
Frayer-Miller	1
Fuller	5
Garford	20
Gaylord	4
Glide	22
Grant	260
Great Western	9
Halladay	27
Hartford	1
Havers	51
Haynes	171
Henderson	12
Henry	60
Hercules	3
Herff-Brooks	14
Herreshoff	145
Hollier	2
Homer	1
Holsman	4
Howard	2
Hudson	1565
Hupmobile	1955
Exiron	8
Ideal	1
Imperial	458
Inter-State	23
Jackson	979
Jeffery	390
Jewett	1
Johnson	1
Kath	1
Keeton	11
Kenmore	3
King	327
Kisselkar	158
Knight, Silent	1
Knox	5
Krit	878
Kron	1
Lambert	124
Lexington-Howard	58
Lion	153
Little	190
Locomobile	58
Lozier	198
L-P-C	30
Marathon	25
Marion	54
Marmon	30
Marquette	37
Marquette	1
Marvel	4
Mason	7
Matheson	6
Maxwell	3218
Maxwell	466
McFarlan	5
McIntyre	7
Melbourne	1
Mercer	16
Meteor	4
Metz	365
Metzger	183
Michigan Auto	26
Michigan Buggy	133
Michigan Motor	163
Midland	4
Middleby	1
Millercar	36
Mitchell	662
Moline	27
Monarch	49
Monroe	233
Moon	17
Mora	7
Mt. Pleasant	7
National	47
Nichols	1
Northern	62
Northway	2
Northwestern	1
Norwalk	1
Nyberg	18
Oakland	2008
Ohio	3
Oldsmobile	1035
Orient	2
Orion	1
Overland	7425
Owen	18
Packard	619
Paige	1424
Palmer-Singer	8
Partin-Palmer	10
Parry	14
Pastora	1
Paterson	550
Pathfinder	6
Peerless	126
Peninsular	2
Perfection	1
Petrel	2
Pierce-Arrow	150
Pilgrim	1
Pilot	3
Pioneer	2
Pope	116
Pratt-Elkhart	7
Premier	25
Princess	7
Pullman	50
Punchs-Finch	3
Puritan	2
Rainier	18
Rambler	2
Rayfield	1
R-C-H	551
Read	12
Regal	982
Remington	1
Reo	4863
Ross	6
Royal	8
Ryder-Lewis	9
Saxon	1193
Schacht	31
Scripps-Booth	103
Sears	40
Selden	8
Simplex	12
Speedwell	24
Sphinx	4
Springfield	1
Stanley	34
Stayer	4
Stearns	25
Stevens-Duryea	89
Stewart	1
Stoddard-Dayton	168
Studebaker	5014
Stutz	23
Suburban	11
Sultan	1
Templeton	1
Triumph	1
Thomas	90
Valey	8
Velie	53
Victor	1
Vulcan	12
Wahl	8
Warren	443
Wayne	48
Welch	78
Westcott	30
White	124
Whiting	1
Winton	366
Wolverine	3
Zimmerman	10
Miscellaneous	822
Total	108,102
Gasoline Passenger Foreign	
Benz, German	5
Berliet, French	2
Bianchi, Italian	1
Brennabor, German	2
Bugatti, German	1
Clement-Bayard, French	1
Darracq, French	2
De Dion-Bouton, French	1
Daimler, English	2
Fiat, Italian	4
Hispano-Suiza, Spanish	1
Hotchkiss, French	1
Mercedes, German	2
Mors, French	1
Napier, English	1
Panhard, French	1
Renault, French	12
Rolls-Royce, English	2
Wolseley, English	1
Total	43
Gasoline Trucks	
Admiral	2
Aetna	3
Alco	3
Atlas	2
Atterbury	1
Avery	2
Autocar	57
Bale	3
Boyden	1
Beyster	12
Cass	30
Chase	39
Clark	2
Commerce	143
Commercial	6
Crown	2
Dart	1
Day	1
Deal	1
Decatur	3
Denby	14
Detroit	6
Dowagiac	1
Dudley	1
Duplex	15
Enterprise	1
Falcon	2
Federal	281
Flint and Best	91
Flint Wagon	8
F. W. D.	5
Gaeth	2
Galloway	1
G. M. C.	302
Gaylord	16
Grabowsky	70
Gramm-Bernstein	21
Hall	1
Hazard	1
Hewitt	2
Horner	42
Huron	2
I. H. C.	369
Indiana	2
International	23
Johnson	2
Kalamazoo	22
Kelly-Springfield	63
Kiblinger	2
Knox	8
Kobush	1
Koehler	2
Kosmath	11
Krebs	1
Lauth-Juergens	4
Lippard-Stewart	2
Little Giant	21
Logan	2
Mais	4
Menominee	35
Mercury	1
Modern	1
Mogul	2
Monitor	1
Motor Wagon	2
O.K.	3
Oliver	17
Packard	142
Parcel Post	11
Paulding	1
Peerless	29
Pierce-Arrow	20
Plymouth	1
Poss	30
Pull-More	1
Randolph	9
Rapid	65
Reliance	15
Reo	144
Republic	159
Sampson	62
Schmidt	1
Seitz	13
Selden	6
Service	3
Signal	34
Soules	1
Standard	59
Star	29
Stegeman	5
Sterling and Sternberg	10
Stewart	1
Streator	8
Superior	3
United	25
Universal	174
U. S.	5
Van	5
Van Dyck	13
Vim	9
Vulcan	1
Wagenhals	10
Ward	2
Weier-Smith	2
White	44
Wichita	1
Wilson	3
Wisconsin	1
Miscellaneous	75
Total	3032
Electric Passenger	
Argo	46
Babcock	11
Baker	117
Borland	2
Broc	10
Century	91
Chicago	2
Church-Field	33
Colonial	2
Columbus Buggy	34
Detroit Electric	670
Eagle	1
Flanders	22
Fuller Buggy	23
Grinnell	154
Hupp-Yeats	59
Milburn	8
Ohio	58
Phipps-Grinnell	5
Rauch & Lang	174
Rex	3
Standard	9
Storms	1
Walker	15
Waverley	4
Woods	104
Total	1658
Commercial Electric	
Baker	24
Champion	3
Couple-Gear	9
Detroit	56
G. V.	16
M. & P.	3
Walker	2
Miscellaneous	5
Total	118
Grand total	112,953

The Rostrum

80 Per Cent of Fuel Not Vaporized

I HAVE just read with unusual interest the question of A. I. A., in your issue of March 2, 1916, on page 422, subject, "Piston Displacement per Mile Measures Consumption."

The writer of that apparently simple question has outlined what in my opinion is the only method the engineers designing gas engines in the future can use if they wish to intelligently ascertain just what the fuel economy of any engine really is, and how far short the actual road performance of the average American motor vehicle is of the practicable and possible miles per gallon, for any given piston displacement, load to be carried, etc.

A. I. A. says his Oakland, model 50, Northway engine has a piston displacement of 346.4 cu. in., etc., and figures the total displacement of gas is 242.65 cu. ft. per mile traveled of his car.

It is true that his engine does actually use the amount of gas he states for each mile traveled regardless of the speed. But one must consider that it takes a gas rich in oil vapor converted into a homogeneous mixture with air, and then transformed into gas, either in the carburetting device itself, or partially therein, partially in manifolds, valve chambers and in the cylinder under the heat of a former charge, the heat of compression, and the heat generated by the spread of flame after ignition. He makes the mistake, however, of assuming that one gallon of gasoline makes but 25 cu. ft. of vapor.

A gallon of 61 deg. Baumé gasoline, at 60 deg. Fahr., either in the laboratory or in a proper gas generator for motor vehicles, will make approximately 240 cu. ft. of oil vapor at approximately 8 in. water tension.

That amount of vapor, mixed with approximately 22 parts air by volume, will, when converted by heat properly applied so as to convert the mixture of vapor and air into dry gas at a temperature higher than the highest boiling point of the heaviest hydrocarbon in the gasoline, give approximately 5500 cu. ft. of gas mixture, having the highest explosive combustibility, under the average compression in the model of engine he mentions, when the engine speed is approximately that able to drive his car at the rate of 20 m.p.h. on relatively level roads.

This, provided the intake manifold and valve chambers are properly designed so as not to waste any of the gas power between the gas generator and the intake valve by expansion. A superheated gas as herein contemplated performs work by mere expansion in the manifold and valve chambers, also in the intake stroke of piston in cylinder, just the same as superheated steam performs work when it expands in the high pressure cylinder of a compound engine, etc.

Now, A. I. A. can readily figure for himself, that his car should run on the piston displacement basis at 20 m.p.h., on fairly level roads, 22.3 m.p.g. At 30 m.p.h. he should run approximately 18 m.p.g.

To give A. I. A. some idea of the power that gas would have, it is enough to say that his car should accelerate from 5 to 30 m.p.h. on high gear in 10 sec.

The gas does not get richer as the speed of the engine increases. But the horsepower to produce the speed increases. so that if a carbureter or gas generator at 800 r.p.m. uses say 55/100 lb. of gasoline per horsepower hour, to develop a certain power to drive the car at that speed, at 30 m.p.h. the horsepower would be considerably greater, but the fuel consumption per horsepower hour would be approximately the same. The difference being in road work, in using more mixture in less time to secure the higher speed than the lower speed.

The trouble with motor cars to-day in the hands of the public, using low volatile gasolines, is that but 10 per cent of the gasoline used is vaporized, 10 per cent partially atomized and 80 per cent of the liquid actually goes into cylinders as raw liquid. There is not time in high speed engines for all this liquid oil to be transformed from liquid to vapor, or gas, before the dead center of the piston, and any flame which develops after the piston starts to fall, adds little if any power to the crankshaft, although it does burn up the oil. To that extent it is wasting valuable fuel oil, due to the low volatility of oils of to-day being used in engines designed for highly volatile oils.

New York. W. P. D.

Two-Cycle Problems

Editor, THE AUTOMOBILE:—Was there a patent ever granted on the two-cycle 2 dia. piston motor? If so, to whom?

2—Would not the two-cycle motor be as efficient as the four-cycle if the cylinder was scavenged with air before admission of mixture, assuming the air to be forced in by some mechanical means?

3—Does THE AUTOMOBILE know of any experiments along this line? The writer has been advised that the Elmore 2 dia. piston motor was a failure, owing to leakage by the piston from the larger diameter to the smaller.

4—Did the Elmore motor have packing rings inserted in the small cylinder to pack against the compression of the larger bore? C. H. P.

Jefferson, Ohio.

—There have been innumerable patents granted to two-cycle two-diameter piston motors. It would be impossible to give a complete list.

2—There is no fundamental reason why this should not be the case.

3—There have been innumerable experiments by a great number of inventors. The majority of two-cycle engines have been lacking in some way because their inventors tried to make them too simple.

4—There were rings on both the large and the small diameter parts of the piston.

Four Most Economical

Editor THE AUTOMOBILE:—We Americans are the greatest automobile manufacturers in the world, but are we the makers of the best automobiles? In my opinion we are not. The tendencies in design on both continents are radically different. Abroad the manufacturers have stuck by the small high-speed four-cylinder engine. Why do the manu-

facturers in this country build six-, eight- and twelve-cylinder motors? The experts here claim that the high price of fuel abroad is their reason for using the four-cylinder motor. The price of gasoline to the European is of little consequence, for there only the wealthy own machines. You say the public demanded a smooth-running car in which one did not have to change speeds. There is the whole problem. The transmissions in American automobiles are abominable. The slogan of many cars is that we do not have to change speeds. They could not build a gearbox to shift speeds satisfactorily so they stuck on more and more cylinders until shifting was unnecessary. The question is this: Would you prefer two-, four- or eight-cylinders to one more speed in the transmission properly designed?

2—What clearance has the new Marmon between cylinder and piston?

3—What clearance have the Peugeot racing cars between cylinder and piston?

4—What clearance would you advise when fitting aluminum pistons to a small high-speed motor to be used for high-speed work?

New York City. S. G.

—Undoubtedly the four-cylinder car of high-speed type is the most economical if the driver is prepared to shift gears frequently. There seems to be a difference between the characteristics of European and American drivers. The former have no objection to gear shifting while the latter do not like to have to do it.

2—Approximately 6/1000 of an inch.

3—Ten to 12/1000 of an inch.

4—About 2½ thousandths per inch of diameter.

Timing for High Speed

Editor THE AUTOMOBILE:—I have a four-cylinder water-cooled motor 2½ in. bore by 4-in. stroke. I have cleaned and overhauled it this winter. In checking up the timing of the valves I noticed the intake valve remained open until the piston was half way up on compression stroke, so I changed it so it will close when the piston is about ¼-in. past lower dead center. After doing this the valves all seemed to be correct, that is, exhaust opening just before lower dead center and closing just before dead center. Intake opening about ⅛ in. past top dead center and closing at ¼ in. past lower dead center. Now my trouble is this, although the exhaust valve opens before lower dead center on the explosion stroke just as it opens there must be a very large vacuum or something in the cylinder because there is a very small back suction through the exhaust pipe. I have only noticed this in turning the engine over by hand perhaps when she gets to working the explosion will stop this back suction. The intake is a continual suction, no back blow. Perhaps you could give me the exact timing by diagram if this timing is wrong. The motor in high speed is supposed to develop 15 hp. but of course only figures 10.

New York City. S. A.

—Probably the original timing was correct for your engine. Many high speed motors operate best with the intake valve closing very late. If the original timing was in accordance with the maker's setting it will be right and you probably cannot improve upon it.

Fitting Bronze Bearings

Editor THE AUTOMOBILE:—I have a model 17-1909 Buick, which is fitted with full babbitt connecting rod bearings. They require close attention and pound out in very short time. Would a full bronze bearing without babbitt face be advisable? If not, what would you advise?

2—Will you kindly give me the names of a few concerns who would make these bearings?

Genoa, Neb. C. L. A.

—Your experience with these bearings is rather unusual and you will be well advised to make a careful examination of the lubrication system to see that this is operating properly. If this fails to cure the trouble any repair shop will make you bronze bearings with a babbitt face and these are of course stronger than the full babbitt although the latter are most commonly employed in modern engines.

Try Kerosene Mixture

Editor THE AUTOMOBILE:—Would you kindly advise me as to whether the Schebler model L carbureter on my Overland model 59 would handle kerosene as a fuel or not? Would any change be necessary? I have been thinking that I would reduce the tension on the auxiliary air intake valve spring. Would this be advisable or not? I am going to fit a small tank on the dash of the car to supply gasoline for starting.

Vineland, N. J. R. W. C.

—You will very likely find the carbureter will operate well on a half and half mixture of kerosene and gasoline. Some engines run well on this mixture though not all. It will probably need more air. You would be well advised to fit the small tank for starting purposes.

Applying Kerosene to Gas Motor

Editor THE AUTOMOBILE:—To burn kerosene instead of gasoline in a modern gasoline engine what would be the necessary changes to make?

2—Just what effect would the using of kerosene have on the motor and how different from when gasoline is used?

3—Make comparison regarding power, fuel consumption and motor cleanliness.

4—Would it be advisable to use a six-cylinder on a farm tractor instead of a four-cylinder of the same power? State advantages and disadvantages.

De Kalb, Ill. W. B. S.

—A certain quantity of kerosene can be mixed with good gasoline and used in an ordinary carbureter but to burn pure kerosene a special vaporizer is necessary.

2—Usually an engine running on kerosene carbons up more rapidly.

3—There should be practically no difference in power, fuel consumption a little heavier and motor cleanliness inferior.

4—Probably not, the four-cylinder being simpler and having fewer parts.

Speeding Up Buick Model 10

Editor THE AUTOMOBILE:—I am rebuilding a Buick model 10 motor for speed purposes and wish to increase the length of the piston from the wristpin up to give me a higher cylinder pressure. What was the original cylinder pressure of this motor and how much should I lengthen the piston to bring the pressure up to modern requirements?

2—At what speed did this motor develop its maximum power and what was that power?

3—Can you offer me any suggestions to increase the speed and power of my motor?

Marion, Ind. A. E. V.

—It would probably be unwise to increase the compression of your Buick motor as this was designed for the present compression.

2—Model 10 engine developed a maximum of 30 hp. at 2200 r.p.m.

3—For increasing speed, we would suggest the lightening of all reciprocating parts and careful balancing of rotating members. Valve opening can be increased by substituting exhaust cams for inlet cams, and the bottom half of the valve cages can be cut off and the valves seated directly in cylinder head. The magneto timing can also be advanced a little.

Australia Needs Cheap Cars

Stringency of Money Combined with Prosperous Conditions of Industry Creates Market for Low Priced Cars —Country Will Absorb Large Numbers This Year

By THE AUTOMOBILE'S Special Correspondent

THE outlook for the immediate future of the automobile trade in Australia is not a very promising one. The war is costing the Commonwealth $6,250,000 a week, and this has to be paid for by ourselves and not by the Imperial Government, as this party has its hands full with its own affairs. There have been two successful war loans floated in this country, which shows that the wealth of the people is more than anticipated, but this loan, unfortunately as far as trade is concerned, is attracting money that otherwise would have been put into different channels, such as purchasing automobiles. No doubt further loans will have to be floated as expenses keep going.

However, there is one consolation, that is, trade will never go flat while we get good seasons here. The wheat crop this year was enormous, and the same with the wool. The trouble is to shift it away from the country, and the enormous freights that have to be paid does not give the producer the amount of profit he would get in normal times. In fact, the government has commandeered the whole, and so far is only allowing the producer 30 cents a bushel, with the promise that if there is anything left over after the government has finished shifting it to other parts of the world, they will be paid the surplus. It is the producer on the land who is the greatest car buyer.

Mineral Exports Fall Off

On the other hand, there is an immense falling off in the export of mineral wealth, more especially coal. All the mining centers now are very dead indeed, and the purchasing power of the people interested must suffer as a result. Of course, like every war-stricken country, we are burdened with heavy taxation, and this naturally must restrict the purchasing power of the people somewhat.

For the future, though, a good market for the low-priced light American car is assured. At the time of writing freights are $40 a ton, and this, together with other charges, brings the importation cost of the average motor car up to nearly $1,000. These figures include ocean freights, inland freights ranging from $35 to $85, depreciation of English money, exchange assurance and other factors. Thus you will see that the $1,000 car has to be sold in this country at a price something like $2,000.

Practically every make of American car has now found agents in this State, but the older firms do not lose anything by this. The business of several firms has increased by more than double in the last few months, among them being Overland, Hupmobile, Studebaker and Oakland. At present the newcomer, the Dodge, is causing a sensation.

Having regard to the circumstances, the import figures suggest that American manufacturers did not take the fullest possible advantage of the conditions.

Registration of Cars in New South Wales in 1914 and 1915

Return compiled from information supplied by Traffic Department:

	Year 1914	Year 1915
New Registrations, Cars	3293	2758
New Registrations, Commercial Vehicles	229	280
New Registrations, Motor Cycles	3147	2629
Licenses, Drivers	5597	5980
Licenses, M. C. Riders	3550	3796

	On Dec. 31, 1914	On Dec. 31, 1915
Total Cars in use in N. S. W.	10,001	11,346
Total Motor Cycles in N. S. W.	6373	6401
Total Drivers Registered in N. S. W.	16,058	18,800
Total M. C. Riders in N. S. W.	8095	6602
Commercial Vehicles in N. S. W.	585	749
Taxi-cabs in N. S. W.	236	232
Taxi-cab Drivers licensed	377	366

AUTOMOBILE IMPORTS TO NEW SOUTH WALES

Return showing the Imports according to Countries whence imported and Countries of Origin of Motor Cycles, Motor Car Bodies and Chassis during the calendar years 1914 and 1915.

Country Whence Imported	1914	1915
United Kingdom	$987,050	$404,960
Canada	528,055	342,615
Ceylon	1,020	.....
Fiji	10	3,720
India	3,045	455
New Zealand	35,980	15,670
Belgium	140,020	2,840
France	20,670	10,910
Germany	104,550	2,445
Italy	89,495	162,555
U. S. A.	555,730	656,625
Hawaiian Is.	.....	570
Java	.....	8,835
New Caledonia	.....	2,145
Totals	$2,465,625	$1,614,345

Country of Origin	1914	1915
United Kingdom	$801,875	$349,400
Canada	338,480	273,515
New Zealand	50	.....
Austria	1,210	.....
Belgium	58,185	18,705
France	184,790	53,335
Germany	156,785	12,235
Italy	110,575	171,425
U. S. A.	797,675	732,345
Switzerland	.....	3,385
Totals	$2,449,625	$1,614,345

Bodies

United Kingdom	$151,100	$66,375
Canada	127,030	84,670
Ceylon	140	.....
Fiji	4,410	1,005
New Zealand	7,530	3,370
Belgium	5,780	875
France	570	.....
Germany	8,565	500
Italy	6,695	7,195
U. S. A.	132,385	158,985
India	.....	330
New Caledonia	.....	330
Hawaiian Is.	.....	105
Java	.....	340
Totals	$444,205	$324,080

United Kingdom	$147,415	$66,750
Canada	75,660	64,595
New Zealand	225	.....
Belgium	1,135	.....
France	6,950	2,455
Germany	11,955	2,020
Italy	8,245	7,195
U. S. A.	192,620	180,185
Commonwealth	.....	880
Totals	$444,205	$324,080

Motor Cycles

United Kingdom	$277,035	$188,470
Canada	2,000	1,430
New Zealand	1,400	2,075
Belgium	11,020	.....
France	1,075	.....
Germany	1,015	.....
Italy	1,090	.....
Java	165	.....
Netherlands	75	.....
U. S. A.	4,210	17,755
Totals	$299,085	$209,730

United Kingdom	$277,670	$188,255
Belgium	9,605	70
France	265	.....
Germany	2,165	235
Netherlands	75	.....
Switzerland	2,385	750
U. S. A.	6,920	20,225
Canada	.....	195
Totals	$299,085	$209,730

ACCESSORIES

Bergen Carbureter

THIS carbureter, just introduced after tests during nearly five years, is of the constant vacuum and metering pin type, as shown in the illustration. The distinctive feature is the use of a ported piston *P*, which operates within a ported cylinder *C*. No springs or auxiliary air valves are employed. The suction of the engine controls the opening and closing of the air ports, the movement of the piston varying with the speed of the engine. Attached to the piston is a tapered metering pin *M*, which moves with the piston, being suspended from a ball so that the pin moves up and down within the gasoline jet *J*, increasing and decreasing the gasoline aperture. The pin is tapered in relation to the opening of the ports so that the correct proportions of air and gasoline are maintained, no matter how much the engine speed may vary.

When starting, the piston is down and the ports are closed. Air is supplied through the hot air hose *A*, passing through a series of holes *B* in the base of the cylinder, then through the venturi leading it to the top of the jet, where it meets the gasoline. From here the air and gasoline mixture passes through the spray *H* and is deflected into the mixing chamber. This arrangement, in conjunction with the constant vacuum principle upon which the carbureter is based, facilitates starting under all conditions and, after the engine is warmed up, aids carburetion.

After starting, when the suction of the engine has lifted the piston, the gasoline passing up the jet mixes with the hot air, passes through the spray, strikes the baffle plates in the base of the piston and passes into the mixing chamber, where it is thoroughly mixed with the air taken in through the lower ports and further mixed when passing the upper ports.

The only adjustment on the carbureter is made by the lever *L* attached to the gasoline jet by which the jet can be raised and lowered, thus changing the mixture by bringing a different part of the tapered pin *M* into operation. When this adjustment is properly set at any speed the mixture is correct at all speeds. The metal float is of standard construction, gasoline being delivered to the float chamber through a fine mesh strainer.

Some of these carbureters have been in successful operation for a considerable time. The manufacturers claim that workmanship and material are of the best and that the adaptability of the various parts is unusual. List prices are: 1-in., $25; 1¼-in., $30; 1½-in., $35; 1¾-in. $40; and 2-in. $45.—Bergen Carburetor Co., Inc., Long Island City, N. Y.

Pennsylvania Ebony Tread

This new black-tread tire, illustrated herewith, is claimed to offer unusual resistance to cuts, punctures and abrasion, owing to the great thickness and toughness of the tread. The manufacturer guarantees this addition to its line, which includes the Pennsylvania Vacuum Cup tires, for 5000 miles.—Pennsylvania Rubber Co., Jeannette, Pa.

A C Long-Body Titan Plug

This new plug, recently placed on the market, follows A C Titan design and is called the long body ⅞ A C Titan, having the standard S. A. E. ⅞-18 thread but differs from other models in that the body of the plug is considerably longer rendering it particularly suitable for motors in which the plugs are located in a deep recess. It sells for $1.

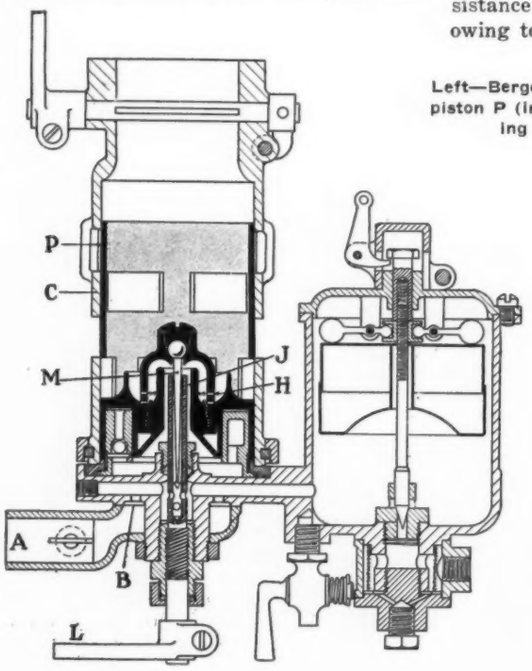
The A C Titan plug is also made in a long body metric size particularly adapted to foreign cars. Renault has adopted it as regular equipment. The plug is furnished either with regular length of thread or with extension.—Champion Ignition Co., Flint, Mich.

Top Covering for Fords

A top covering ready to attach to any Ford is made of a rubber composition. It takes the place of the old top when it is worn and leaky.—Cray Bros., Cleveland, Ohio.

Airspring Grease Cups

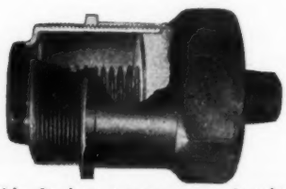
The body of this grease cup is internally threaded and a hollow top screws in air tight. Within a cap is a metal disk which rests on the grease and is pressed down by a light coil spring. Screwing down the cap increases the air pressure in the cup and causes the grease to be fed gradually. Air pressure is assisted by the spring. The cups are of pressed steel and all parts are readily removable for cleaning. Copper and brass finishes may be had, and polished or nickel-plated finishes are extra. Prices, plain, ½-oz., $1; 1 oz., $1.25; 3 oz., $1.50; 6 oz., $1.75.—Hunter Pressed Steel Co., Philadelphia, Pa.



Left—Bergen carbureter in section, showing ported piston P (in black) operating in ported wall of mixing chamber C. Note hot air hose A

Right — Pennsylvania Ebony tread tire which is said to be unusually tough and durable

Long body ⅞ A C Titan spark plug



Air Spring grease cup, showing spring actuation

The Automobile

PUBLISHED WEEKLY
Copyright 1915 by the Class Journal Co.

Vol. XXXIV Thursday, March 16, 1916 No. 11

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
A. B. Swetland, General Manager
T. B. Van Alstyne, Advertising Manager
231-241 West 39th Street, New York City

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United States and Mexico - One Year, $3.00
Canada - One Year, 5.00
Foreign Countries - One Year, 6.00

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Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Air Cooling

IT is impossible to read F. W. Lanchester's analysis of the problem of cooling internal combustion engines without a feeling of surprise that so little has been done to develop the air-cooled cylinder type. After abandonment by Lanchester's own concern the Franklin car remained the only air-cooled car in the world, barring very small machines. The early Lanchesters were entirely successful engines, and the Franklin is equally so, yet there are no imitators.

The immense concentration of thought upon the aeroplane engine which is observable at present cannot fail to establish exactly what are the good and bad points of air cooling as applied to engines of all sorts of designs. Whereas data on the subject used to be scarce, it will soon be plentiful, and it is interesting to ponder upon the probable effect on automobile engineering.

It is unquestionable that the water needed by most cars is a nuisance. We are so accustomed to it that the trouble in keeping the radiator full, in preventing it from freezing, in guarding its delicate structure from injury has become second nature. If it can be abandoned so much the better, if we lose no other qualities concurrently.

In these days, when new ideas are being accepted so readily, it seems fitting that the subject of air-cooling should receive its share of attention by automobile engineers. There is now no doubt whatever that automobile engineers are going to be the aeronautical men of the future, at least so far as the power plants are concerned, and this can only mean that the design of aeroplane engines and of car motors will become more similar.

War has proved that the automobile engineers could make the best engines by far; it has completely discredited the aero specialists who claimed that theirs was a special subject, and it is thus impossible to believe that automobiles of the air will not henceforward be closely identified with those of the land.

Engine Temperature Control

AS gasoline becomes of heavier gravity, the need for some automatic means for controlling the temperature in the water system of the modern car is apparent. All sorts of makeshift devices are used for shutting off part of the air that passes through the radiator, so it is a strange thing that engineers have not hit upon a method of regulating the cooling in proportion to the demands of the engine at any temperature.

In summer a larger cooling area is wanted; in winter very much less, and it is surprising that someone has not hit upon a means for controlling this either automatically or manually, just as the heating of the carbureter is controlled.

The attempt to control the temperature of water in cylinder jackets has been very successful, but, having regard to the fact that the air passing through the radiator is the ultimate cooling medium, it would seem possible to obtain the advantages of the thermostat by controlling the air flow instead of the water flow. There is a correct temperature for each type of engine, and anything which assists to maintain that temperature accurately will be an improvement to the car.

Individuality

THE ultimate future of custom body building just now offers an interesting field for speculation. The outstanding fact is that there is a greatly growing demand for special bodies, for automobiles that are distinctive from all others.

There are two possible viewpoints. One is that the present state of affairs is a passing craze which will die away, and that the steady improvement of the stock body will reduce the demand for bodies that are built specially. The other view is that the men who can well afford to have what they want are waking up to the fact that there is a greater pride of possession in a car which is unlike any other in the world, than in a vehicle made to pattern.

If the latter idea is the true one, and it appears the more rational in many ways, then the building of custom bodies is likely to become a very important branch of the industry. In Europe the carriage building trade has flourished exceedingly under the automobile régime; it has even grown, and there seems no reason why the same thing should not happen in America.

Motor Reserve Called Out for Service in Mexico

Los Angeles Corps Ordered to the Border—Five Companies of Volunteers Ready for Service—War Department Buys Fleet of Trucks

LOS ANGELES, CAL., March 12—Volunteers in the Los Angeles Motor Reserve Corps and the recruits in new corps which are being organized this week are to have a chance to show what they can do as quickly as things begin to happen when Uncle Sam gets into action down Mexico way. The first call for volunteers sent out from Washington came this week to the motor reserve corps of California cities, while the well-drilled Los Angeles corps received notice to depart for the border Wednesday, March 15. These are the men who belong to the battery which has been getting in trim for military service, staging practice maneuvers and trial runs in the vicinity of Los Angeles and San Diego in the last few weeks. In addition two full companies of touring car reserves have been recruited in Los Angeles, ready for immediate service. San Francisco is sending two companies and San Diego early this week completed the organization of a fifth company.

The Los Angeles Motor Reserve Corps is under command of Lieut. Al G. Waddell, staff correspondent for THE AUTOMOBILE. He will keep THE AUTOMOBILE readers informed of the operations of the motor reserves during the Mexico expedition. The entire body of motor reserves will go into the field under command of Capt. H. D. Ryus, winner of the first Phoenix road race.

Truck Efficiency High

The corps led by Lieutenant Waddell is the volunteer motor reserve organized in the United States. In recent maneuvers it was shown that a field artillery train composed of four 2½-ton Moreland, worm-drive trucks, the type so far used, are equal to fifty cavalry horses in moving equipment, not considering that they will cover as much ground in a half-hour's time as a troop train could cover in a hard day's driving. It looks as if Gen. Francisco Villa's sharpshooters will have to contend with a considerable amount of dust when the motor artillery drives in their direction, especially since the government has purchased 54 new trucks.

Watt L. Moreland, manager of the Moreland truck factory, is a private in the motor reserve corps and has been present at the practice expeditions. He will furnish fifty-four expert drivers. The men in all of the volunteer companies have undergone a rigid physical examination. Before the truck drivers are accepted for service the officers examine them in the operation of Moreland trucks.

A 3-in. field gun and twenty men were carried on each of the four trucks which recently made the 132-mile run from Los Angeles to San Diego, and a complete field battery, consisting of the gun, shells and battery wagon, weighing more than 4 tons all told, was transported as well. The gun and caisson were trailed behind one of the trucks. The average speed was 20 miles per hour.

In co-operation with Uncle Sam's aeroplane squadron the motor reserve corps will constitute one of the army's chief adjuncts, in the event of an extended expedition into Mexico. The distances and the sparsely settled condition of the region will require exceeding efficiency in maintaining the lines of communication and in moving supplies. Americans may see American military motors in action at the moving picture theaters in future where they have become accustomed to seeing foreign pictures. Cameramen for the news films can take real instead of "faked" pictures for a while. Lieutenant Waddell will tell the story from week to week.

Determined to conduct the pursuit of General Villa in an efficient and modern manner, the War Department asked for bids on two complete motor truck companies, opening on March 14. Besides the short notice given bidders, the action is also interesting in that not only are the manufacturers requested to furnish the chassis but the drivers and officers as well.

NEW YORK CITY, March 15—Colonel A. L. Smith, the United States Army Depot Quartermaster, has awarded to the White Motor Co., Cleveland, and the Thomas B. Jeffery Co., Kenosha, the contract for furnishing the trucks requested by General Funston for the coming campaign in Mexico.

Colonel Smith said he believed that speed in delivery was the prime factor on which the awards were based, and he attributed the selection of two companies instead of just one to a desire on the part of the Government for an experiment in trying out distinct types of machines.

The proposals were for fifty-four 1½-ton motor truck chassis, two wrecking and supply trucks to be equipped with machines for field repairs, such as a small lathe, a drill-press, a forge and a bench vise, and a selection of repair parts. In addition to these, fifteen motorcycles for the use of corporals and messengers are to be supplied. These trucks will be divided into two companies organized along lines identical with those used for horse companies, there being twenty-seven trucks and one wrecking car in each company.

The men desired to go with the vehicles are one truckmaster at $150 per month, three assistant truckmasters at $125, one mechanic at $125, one assistant mechanic at $100 and twenty-seven drivers at $100 for each company. These men are to be civilians familiar with the operation of the vehicles, and are to be paid by the Quartermaster Corps.

No bodies are asked for; the regulation United States army body, 10 ft. 4 in. long, will be used. The trucks are to be delivered f.o.b. the factory. The regulation United States army specifications for 1½-ton trucks are asked for, but delivery will be one of the prime considerations.

More reliance is to be placed upon these two companies than would at first be apparent, for it is expected that the two truck companies will furnish the entire transportation for the present force of 5000 men, in the expedition into Mexico, between the base of supplies and the troops. Each regiment will have its own company of twenty-seven horse wagons, but the trucks will be the connecting link between all five regiments and the base of supplies.

Colonel Smith, who has seen service in Sonora, states that one truck company of twenty-seven trucks should be sufficient for the entire force for the first four marches of 20 miles per day, after which the second company will be needed. He points out that service in Mexico will be very different from that in Europe today, as the distance which the troops will travel and the amount of marching they will do will be much in excess of that encountered abroad.

It is estimated that the two truck companies will cost about $125,000.

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Handle Time Payments for Dealers of Twenty Factories

NEW YORK, March 13—The Guaranty Securities Co., Toledo, through which the Willys-Overland Co. a short time ago completed arrangements for the disposal by its dealers of cars on the time payment plan, is about to be reorganized and its scope of operations greatly increased. Under the reorganization plan, the company will be known as the Guaranty Securities Corp., and will be prepared to handle time payment business for the dealers of some twenty different manufacturers. The system under which the corporation will operate is somewhat similar to the general plan outlined in AUTOMOBILE for March 1, there being no expense to the dealer.

Overland Income $9,870,678

Earns Over 46% on Common After Adding in $1,000,000 Set Aside for Emergencies

TOLEDO, March 13—The annual report of Willys-Overland, Inc., for the fiscal year ending Dec. 31, 1915, which has just been made public, shows a net income of $9,870,687 for the year, after setting aside $1,000,000 as a reserve for contingencies. With this reserve added, the figure is equal to over 46 per cent earned on the $21,000,000 of outstanding common stock after figuring 7 per cent on the preferred stock of $15,000,000. The report also shows a profit and loss surplus at the end of the year amounting to $14,720,550, as against $7,651,931 for the previous year, or practically double, thus evidencing the excellent condition of the concern at the start of its largest production year. During 1915, there was redeemed $250,000 of preferred stock, this amount being included in the surplus account.

The total of assets and liabilities reached $58,908,803 as compared with $43,407,482 the previous year, and in this, the item of good will, patents, trade marks, etc., is still set down at $14,059,932. As an evidence of the plant and real estate extensions of the Overland concern, the increase of the item covering these from $9,127,188 to $16,945,453 this past year is of interest. It shows plant and equipment appreciation of over $7,500,000. The inventories account covering parts and materials on hand also took a big jump from $9,648,745 to $17,752,812.

Comparative balance sheet and report for 1914 and 1915 appear below:

Net after expenses, taxes, repairs, depreciation, etc	$11,201,255
Reserve for contingencies	1,000,000
Interest	330,577
Net income	$9,870,678
Preferred dividends	322,165
Surplus	$9,548,513
Common dividends	2,229,895
Surplus	$7,318,618
Redemption of preferred stock	250,000
Previous surplus	7,651,931
Profit and loss surplus	$14,720,550

The consolidated balance sheet of the Willys-Overland Co., and subsidiaries, as of Dec. 31, 1915, compares as follows:

Assets

	1915	1914
Good will, patents, trade marks, etc.	$14,059,932	$14,059,932
Real estate, buildings, plant and equipment	16,945,453	9,127,188
Investment in and advances to affiliated companies	680,286	2,251,767
Inventories	17,752,812	9,648,745
Balance due from European agents and domestic selling companies	1,081,770	901,942
Accounts receivable	1,929,757	1,813,656
Notes receivable	2,048,494	1,501,283
Miscellaneous investments	70,475	49,925
Cash	4,023,342	3,928,098
Deferred charges to future operations	316,482	124,943
Total	$58,908,803	$43,407,482

Liabilities

	1915	1914
Preferred stock	$4,483,700	$4,721,000
Common stock	21,000,000	20,000,000
Real estate mortgage assumed	448,269	131,500
Notes payable—bank loans	10,200,000	4,434,476
Trade accounts	.....	3,164,820
Accounts payable	4,942,179	1,669,273
Pay rolls and salaries accrued	216,560	46,590
Customers' deposits	451,944	291,760
Taxes and interest accrued	164,426	114,021
Reserve for rebates to customers	424,838	235,485
Reserve for car repairs	30,000	30,000
Reserve for royalties payable	30,000	.....
Preferred dividend payable Jan. 1	78,465	82,617
Reserve funds	1,717,873	834,005
Profit and loss surplus	14,720,550	7,651,931
Total	$58,908,803	$43,407,482

3787 Saxons Shipped in 2 Months

DETROIT, March 4—During the first two months of this year the Saxon Motor Car Corp. has shipped 3787 cars or 2237 more than during those corresponding months in 1915. This is an increase in shipments of 144 per cent.

The February shipments totaled 2231 cars or 1387 more than in 1915. In January 1556 cars were shipped or close to twice as many as last year when 850 were shipped.

Chalmers Starts New Parts Building

DETROIT, March 4—The Chalmers Motor Co., has started the construction of a new four-story manufacturing building, 60 x 400 ft., to be known as building No. 2. Only parts for Chalmers models of past years are to be made in that structure. Part of the main floor will be provided with factory offices and store room. With a wing, 50 by 60 ft. and the service building recently completed, this will provide 156,000 sq. ft. of additional floor space bringing the total of the entire plant to about 777,500 sq. ft.

Van Schlegell Hupp V.-P.

DETROIT, March 6—Arthur van Schlegell has been appointed vice-president of the Hupp Motor Car Co. Mr. Schlegell is a well known Detroiter who has been general manager and vice-president of the Michigan State Telephone Co. He will remain as vice-president of the telephone company, but not as an executive.

Parrott One-Wheel Tractor Announced

JACKSON, MICH., March 4—The Parrott Tractor Co., has been formed in this city to make the one-wheel Parrott tractor. The officers of the company are B. R. Parrott, president; Louis Goodhart, vice-president and sales manager and M. N. Stewart, secretary-treasurer.

The concern has started operations in the plant of the old Fuller Buggy Co.

Perlman Rim Corp. Organized

Demountable Rim Inventor Heads $10,000,000 Concern Controlling His Patent

NEW YORK CITY, March 15—Announcement is made to-day of the formation of the Perlman Rim Corporation, under the laws of the State of New York, with a capital of $10,000,000. The company has acquired all of the patents, applications for patents and rights of L. H. Perlman, the inventor of the Perlman demountable rim, which, in various forms, is now in almost general use throughout the world.

While the company has a broad charter, it will, for the time being at least, confine its operations to the manufacture and sale of demountable rims of which upwards of 700,000 sets will be required to meet the demands for the season of 1916.

Strong Financial Backing

Mr. Perlman, the president of the company, makes the following statement:

"The threatened shut down of automobile production incident to the settlement of the demountable rim patents controversy has now been happily averted. The manufacture of automobiles, so far as demountable rims are concerned, will go on as usual and without pause. Infringing rim makers and users will be treated fairly."

The Perlman Rim Corporation is being financed by Mr. L. G. Kaufman, President of the Chatham & Phenix National Bank, who has associated with him a number of prominent and equally influential interests.

The long continued and vigorously contested legal battle culminating in a recent decision by the United States Circuit Court of Appeals, established for the Perlman patent basic rights and carried with it judgment for an accounting against the rim manufacturers of the country under which back damages of upward of $1,000,000 have accrued.

Manufacturers' Meeting at Detroit

Probably no decision rendered by the courts of this country in recent years has created a greater sensation, due to the entanglements resulting therefrom which bid fair at one time to tie up nearly the entire automobile industry.

The announcement of the formation of the Perlman Rim Corporation which carries with it the assurance of early adjustment of all differences will come as a pleasant surprise to the automobile manufacturers who are to-day (Wednesday) in session at Detroit, Mich., in the hope of averting a crisis.

Full Season For Des Moines

Speedway Plans Include Many Events—300 Mile Free-for-All Heads List

DES MOINES, IOWA, March 13—The Des Moines speedway announces the complete program of events for the season of 1916. A racing meet, limited to Iowa entries, will open the season of Memorial Day. The big event of this meet will be the Iowa Derby, for a distance of 20 miles, and with entries limited to Iowa-owned cars. There will be a 10-mile race with entries limited to Des Moines-owned cars. An Iowa Derby of 20 miles will be held also for Iowa motorcycles and a 10-mile race also for Des Moines-owned motorcycles. The entry fee for these events will be nominal only and the size of the prizes will be determined by the gate receipts.

The big event of the year for the Des Moines speedway will be the 300-mile free-for-all on June 28 with minimum speed requirements, a technical committee to determine the qualification of drivers, and a purse of $10,000. Bob Burman, Billy Chandler and Fred Duesenberg are prominent among those who already have entry blanks for the June 28 event.

A non-competitive program will be staged at the speedway on July Fourth. It will be a sort of celebration with exhibition automobile races, aeroplane flights, fireworks and kindred attractions.

An invitation meet on Sept. 4 will end the Des Moines speedway program for the year. This will be in celebration of Labor Day, which falls on that date. The starts will be limited to six in number and invitations will be issued only to drivers who have finished first or second in races on the American Association speedway circuit for the season of 1916. The winners and the management will split the gate receipts, fifty-fifty.

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Coffin Heads Industrial Preparedness Committee—Speeds Organization Work

NEW YORK CITY, March 15—Howard E. Coffin, chairman of the committee on industrial preparedness of the Naval Consulting Board, yesterday opened headquarters in the Engineers' Building. Here Mr. Coffin will accelerate the work of mobilizing the industries of the country, comprising almost two-thirds of the world's output for preparedness purposes. The co-operation of the nation's business men is being sought through the Chamber of Commerce of the United States. With the support of the manufacturers the next step will be the gathering of information about 40,000 plants through 240 field directors, a board of five men in each State who are leaders in their professions. This information will be tabulated under the direction of W. S. Gifford, chief statistician of the American Telephone and Telegraph Co., who is the supervising director of field work of the committee.

The idea is that the Government will place small yearly orders for military and naval supplies with each plant to be filled at cost and in the event of war each concern will receive orders based on a 10-per cent profit.

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To Handle Federal and Commerce Trucks in New York City

NEW YORK CITY, March 15—The local branch of the Federal Motor Truck Co., Detroit, has been purchased by prominent New York men, who will complete a corporation and will market both the Federal and Commerce trucks in the Metropolitan district. This branch is the last one to be sold, the Federal company having decided more than a year ago to sell all of its branches. After negotiations, Cornelius Vanderbilt, J. B. Ford, Henry Whiton, Edwin Palmer and M. W. Smith, all prominent local club men, were brought together and the deal was made.

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Splitdorf Starts Plant Addition

NEWARK, N. J., March 10—Ground has been broken for the new addition to the plant of the Splitdorf Electric Co., this city. This new six-story building will practically double the present production of 1500 Splitdorf magnetos a day, and will add approximately 110,000 sq. ft. in space. The dimensions of the addition are 300 by 60 ft. and the construction will be along the most modern lines of concrete, brick and steel. It is estimated that the present number of employees, 2000, will be increased approximately 33 1/3 per cent.

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Two Detroit Plants in Cleveland

CLEVELAND, OHIO, March 12—The H. J. Walker Co. has now removed its entire equipment from Detroit into a plant built for it on the grounds of the Chandler Motor Car Co. The Walker shops handle much of the Chandler company's machining.

A plant for the Briggs Mfg. Co., Detroit, is also being erected on a site adjoining the Chandler factory. In this plant the Briggs Co. will paint and upholster 20,000 bodies for this year's Chandler production.

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2,430 Fords in 1 Day—A Record

DETROIT, March 3—The Ford Motor Co. broke its previous output and shipping record Feb. 29, when 2,430 Fords were made and shipped. This is 330 more than the previous high mark.

Four Events Open Sheepshead Bay

New York Speedway Will Have Varied Program of Race Events May 13

NEW YORK CITY, March 15—Four events will open the Sheepshead Bay motor speedway racing season May 13. The feature event will be the Metropolitan trophy, a 150-mile race for cars within the 300-cu. in. piston displacement limit. Entrants will be required to make 90 m.p.h. to qualify, and the race will be limited to 90 min. It is an A. A. A. 1916 championship award event under the new plan of the contest board of that organization for determining racing champions. The trophy will be contested for over three or five years. There will be $15,000 in prizes distributed over seven places, varying from $6,000 for first to $400 for seventh.

The other events are: The 50-mile Queens cup race carrying $2,500 spread over five places; the 20-mile Coney Island cup with $1,500 for five places; both being for cars within the 300-in. limit; and the 10-mile Brooklyn handicap for non-winners, the prize being the Wm. Kemble cup and $1,000 in five prizes. Anyone not taking a prize in the previous events is entitled to compete in this race. These three cups are given outright to the winners.

Big Match Race

The Sheepshead Bay corporation is setting the fashion with short races, another interesting event for the May 13 opening promising to be a match race for 10 miles for a big purse between the three fastest cars in the world.

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Albany Court Holds Maker Liable for Defects

ALBANY, N. Y., March 14—A manufacturer is liable for defects in an article which causes injuries to the purchaser, even though the article is purchased through intermediaries, according to a decision of the Court of Appeals, yesterday. The decision is said to establish a new principle in law, for previous court rulings held that manufacturers were liable only for articles inherently dangerous, such as poisons, explosives and firearms.

Suit was brought to recover damages resulting from being thrown out of an automobile purchased a year before the accident. One of the wheels collapsed and it was found that it had been constructed of defective wood and that the defect could have been discovered upon examination before the car left the factory.

S. A. E. Summer Meeting Program

Full Details of Arrangements for Four-Day Trip on Noronic Now Completed

DETROIT, MICH., March 10—Complete arrangements for the mid-summer cruise of the Society of Automobile Engineers, June 12-16, as evolved by the 1916 meetings committee, contemplate the most extensive summer outing the society has yet undertaken. The steamer Noronic, with accommodations for approximately 550, has been chartered, and the four-day cruise on Lake Huron and Georgian Bay embraces Mackinac Island, Collins Inlet and parts of the thirty Thousand Islands, with a complete day given over to picnicking, fishing and sight-seeing through the island.

The four-day cruise starts from Detroit Monday, June 12, at 2 p. m., and ends here Friday, June 16, at 6 p. m. The complete itinerary is:

Monday, June 12—Leave Detroit 2 p. m., Eastern standard time.
Tuesday, June 13—Arrive Mackinac Island 11 a. m.; leave Mackinac Island 6 p. m.
Wednesday, June 14—Arrive Killarney, Ont., 7 a. m. Day given over to picnics, etc.
Thursday, June 15—Leave Killarney 5 a. m.; arrive Owen Sound, Ont., 3 p. m.; leave Owen Sound 7 p. m.
Friday, June 16—Arrive Detroit 6 p. m.

$35 Inclusive

Full details with regard to tickets, reservations, etc., on the Noronic for the four days have been concluded, and boat tickets including meals and berths in all staterooms (ten parlors excepted) are at $35 each for all members. Guests are charged $5 additional. Children between five and twelve, $17.50 each. The ten parlors, which occupy the best positions on the Noronic and afford special facilities, cost $150 each, this including two tickets and meals, etc.

Entire charge of selling tickets and making reservations is in care of the 1916 meetings committee, which has headquarters at 601 Kerr Building, Detroit, where W. H. Conant, treasurer of the committee is in charge. All applications for reservations must be addressed to the S. A. E. at this address. Checks payable to the Society of Automobile Engineers must accompany all orders for tickets and reservations.

Last year the capacity of the Noronic was well taxed on the occasion of the mid-summer S. A. E. session, but this year so great is the interest that it is expected the total accommodations of 550 will be reserved by May 1. In order that S. A. E. members may not be disappointed in securing space, their applications will receive first consideration providing they are in the hands of the committee by May 1. Previous to this date applications will be considered in the following order: First, S. A. E. members and their families; second, applications of sectional associates; third, applications for guests of S. A. E. members; and, fourth, applications for guests of sectional associates. Names must accompany all applications for tickets and reservations.

Daily Program Drafted

Already a tentative program for the four-day session has been drafted by Chairman George H. Dunham and his associates. This program will give approximately the same time to professional sessions as last year, but will afford more opportunity for recreation. Three of the four evenings on the boat will be given over to entertainment furnished by the six sections of the society, to be followed by dancing. Only one evening—namely, Monday—will be devoted to a professional session.

In order to give all in the party aboard the Noronic an opportunity of becoming acquainted, a promenade will be held on the deck Monday afternoon, soon after sailing, and on Friday afternoon, previous to the party disembarking at Detroit, there will be an *au revoir* promenade.

Picnic June 14

Wednesday, June 14, should prove the greatest picnic day in S. A. E. records, as morning, afternoon and evening will be given over to recreation. W. A. Brush, secretary of the 1916 meetings committee and in charge of steamboat arrangements, has arranged with the Northern Navigation Company to afford facilities for fishing, picnicking and excursions through the islands. Provision will be made so those desiring to charter motorboats and launches for the day can do so through the 1916 meetings committee.

President Wilson May Open World's Salesmanship Congress

DETROIT, MICH., March 11—President Wilson has signified his willingness to open the World's Salesmanship Congress, which will be held in Detroit, July 9 to 13. He stated to H. W. Ford, president of the Saxon Motor Co. and vice-chairman of the program committee of the Congress, who made a special trip to Washington to invite him to attend, that he wanted to be at the Congress at least one day and that, providing something unforeseen did not prevent him at the last minute, he would be there either to attend the opening or on some other day.

Many Additions to Detroit Plants

Numerous Parts and Accessory Makers Find Need for Enlarging Their Factories

DETROIT, MICH., March 13—Automobile parts and accessory makers here figure prominently in the list of local concerns which are having additions or new plants erected. Contractors and architects say that they are doing more work for the parts and accessory makers now than in several years. It is quite natural, because with the big increase in car output many of the parts and accessory makers, in order to take care of the increased needs for their products by the car makers, must greatly enlarge their plants and increase their manufacturing facilities.

The American Auto Trimming Co. is adding a five-story building 254 x 95 ft. to its Meldrum Avenue plant. This will provide 120,650 sq. ft. of additional floor space. The working force is to be increased from 500 to at least 700 men, and the top-making part of the company's business will be concentrated upon at the plant on East Grand Boulevard.

The Detroit Auto Specialty Co. has in course of erection a new enameling plant one story high, 300 x 40 ft. When the plant is completed the company will employ 300 or more men.

A three-story addition 92 x 70 ft., providing nearly 20,000 sq. ft. of additional floor space, is being added to the plant of the National Can Co. With the exception of new offices, the entire addition will be an extension of the automobile radiator department, in which it is said that an average of 150 radiators are made now. The working force will be increased from 600 to 800 or more.

At the General Aluminum Brass Mfg. Co. a third floor 160 x 60 ft. is being added.

Nearly 40,000 sq. ft. of floor space is being added to the former Metal Products Co.'s plant, which since last year is a part of the Timken-Detroit Axle Co. A four-story addition 163 x 60 ft. is in course of construction. At least 400 more men will be given employment, bringing the total up to at least 1650.

The Roberts Brass Mfg. Co. is more than doubling its plant. The additions consist of a new foundry, enlarged machine shops and new offices. When completed the plant will front 300 ft. on Fort Street west, 200 ft. on Junction Avenue and 200 ft. on Merrill Street. Most of the new buildings will be two stories high. The foundry will be located on the second floor, alongside of the alley. The company makes, among many other products, special parts for automobiles.

A.A.A. Grants Hudson Records

Revised Record Sheet Covers Conditions of Non-Competitive Records

NEW YORK CITY, March 9—The recent performances of the Hudson Super Six stock car on Sheepshead Bay Speedway, Nov. 25, were incorporated into the official records of the Contest Board of the American Automobile Assn. at its meeting here to-day. The records granted are non-competitive ones, namely, those in which only one car was on the track and occupy a separate division from competition records. It was necessary for the Contest Board to revise its entire schedule of official records and create a non-competitive division. This division covers practically the same field as the present competitive records and includes all classes of speedway distances according to piston classification; 1 mile circular dirt track distances; speedway records regardless of class; straightaway free-for-all records; and stock chassis straightaway records; and 24-hr. records.

Under this new classification the new Hudson non-competitive records granted are:

Stock car non-competitive records — piston displacement 231 to 300 cu. in.

10 miles	7:54.4
20 miles	15:45.8
50 miles	39:30.8

Under the revision of the official record table it will be possible for manufacturers and others to secure non-competitive stock car and stock chassis records as well as non-stock car and non-stock chassis records. The revised record sheet is sufficiently comprehensive to practically embrace all forms of tests that may be expected for several years to come. In the reclassification all existing records of various classes are continued as heretofore. Up to this time there has been some confusion between records made in competition with other cars and those without competition, namely a single car on the track. The board was convinced it was not right to put competitive and non-competitive records in the same division and hence the new arrangement in which all competitive records are classified under Division 1 and all non-competitive records under Division 2. There are arrangements for official fuel economy records, etc.

The further important work of the board was the drafting of specific rules for stock 24-hr. races. There has been a demand for such and already a sanction has been granted for a stock car race June 16 and 17. The new stock chassis rules permit of certain options on the chassis. A stock chassis is defined as:

"A motor car chassis which for the options and requirements listed below can by adding the necessary parts be assembled into a complete stock car."

The options or changes in construction of the chassis permitted are merely those made necessary by safety in driving and others due to removing the body. Thus it is possible to remove leaves from the springs; to change the angle of the steering column for safety purposes and also to make whatever changes are necessary in gearshift and brake levers as well as pedals. Wire wheels are optional and the rear axle gear ratio is such as the standard axle construction will permit of.

Stock Car Restrictions

Certain requirements are added under the new rules: Thus bonnet straps must be carried, fenders and running boards must be removed, and only stock arrangements of ignition, lighting, starting, carburetion, lubrication, cooling, etc., are permitted. Not the slightest change is allowed in any of these systems. The taping of electric connections at terminals, and the taping or wrapping of piping used in the fuel, water, gas or other lines prohibited. The chassis must have complete set of floor boards and standard dash. Wrapping of springs not permitted. In the race the complete lamp equipment is necessary.

Under the stock chassis definition it is naturally permissible to remove the body, running boards, brackets supporting same and other parts which do not serve any direct part in the function of the vital parts, but which are necessary because of the body.

Many Reinstatements

Considerable routine work was carried out at the meeting: Percy Keene, driver, Danbury, Conn. was reinstated; Roy F. Metz, driver, Detroit, was declared eligible for registration; Jos. L. Mazuco, driver, Chicago was reinstated. Terms of disqualification were reduced on the following drivers so as to terminate at dates mentioned: C. D. Klein, July 1; Wm. E. Brown, Sept. 1.

E. H. Shannon, California, was suspended until July 1 for failure to report to officials and failure to start at a California meet Dec. 28.

The Maxwell racing cars recently purchased by Ray Harroun from an outlaw promoter were reinstated on the ground that when these cars were leased to the promoter under the terms of the contract with the Maxwell company the promoter was in good standing. The mile track at Kalamazoo, Mich., was reinstated on recommendation of Clifford Ireland, board representative, Illinois.

Gas Price Hurts Independents

Standard Oil Gets More Gasoline From Crude Oil by Patent Process

NEW YORK CITY, March 10—The rise of gasoline prices has brought a crisis in the affairs of several of the companies among the Independents. There is an old feud between them and the Standard Oil interests, and every cent that is added to the price of gasoline aggravates the difficulty. It is those who are being pinched the hardest who come with an appeal to the motorists of the country. They urge the necessity of a public policy which will act to conserve the supply of crude oil, and to protect motor car users from excessive gasoline prices in the future. Plans are afoot to renew the effort to pass legislation which would allow federal regulation of oil production by the method proposed in 1913 by Secretary of the Interior Franklin K. Lane.

Ask Public Support

Motorists and manufacturers of motor cars are scarcely aware of the power that might be exerted by their combined influence. Men in the oil business, however, who are looking about just now for a life-belt of some sort, have recognized the vital interest which the motoring public has in the problem of gasoline supply. They see too that more crude oil is required for the manufacture of gasoline than scientific methods make necessary. The patented process of refining, controlled by the Standard Oil interests, extracts from two to three times as much gasoline from the oil as other refineries obtain. This is one source of waste. Too many wells in the same vicinity, a condition which arises when there is no regulation exercised in the drilling and production, constitutes another great source of loss by draining the fields too rapidly and reducing the flow of the wells, at least so the experts declare.

Want Congress to Help

In demanding that Congress adopt a plan of conservation to end the exploitation of the country's oil fields, the companies desiring this step are acting not wholly in spirit of generosity toward gasoline users as they have a selfish motive, too. If it were possible to obtain government regulation of oil lands under Secretary Lane's plan, just as the government now exercises control over the pipeline companies as common carriers, the Independent producers would be placed on an equal footing with the Standard Oil organizations, so far as production is concerned. If at the same

time the patents controlled by the Standard Oil Co. were to be released to the public, the greatest handicap of the Independent refineries would be removed.

Litigation to force such a step is possible, but in years gone by none of the independent companies has shown an inclination to take the initial steps in the fight. Competitors of the Standard Oil Co. assert that the patent on the Burton process is invalid because it is based on improvements to other patents which have expired.

Whatever the merits of the claim, conditions compel the Independent refineries to use two hundred barrels of crude oil oil to produce 40 gal. of gasoline, while the Standard Oil refineries would obtain the same amount of gasoline from 100 gal. of the same quality of crude oil. The burning oil and fuel oil, which are the other products of the still, must be disposed of also, though both are produced in quantities exceeding the normal demand. Thus while gasoline sells at high prices and is scarce, the burning oil and fuel oil are over-plentiful and sell at low prices. Any profit realized on the crude oil must be derived from the gasoline, which is one of the important factors in raising prices. Little or no profit can be obtained from the sale of fuel oils that are produced from high grade crude. This is due to the fact that fuel oil must be sold at a price which is equivalent to, or less than, the cost of coal that would yield the same energy in calories.

The Burton process is commonly known as the pressure-still process and the method is known as "cracking." The government appropriated a sum for experimenting in the methods of refining crude oil three years ago. The Rittman process has been worked out and placed at the disposal of all refineries. An Independent jobber makes this comment:

"One-third of the amount of crude oil that is now used would supply the market for all requirements if all the heavy ends were run through pressure stills. This would have the effect of reducing the price of crude and lowering the cost of all products. The government has made a step in the right direction in the Rittman process, but it is a failure, all reports to the contrary notwithstanding. Even if the method were practical it has not been developed to the point where it can be used. No refineries are using it, and none will under the conditions laid down by the government, which require parties using the process to bear all the expense of developing with no means of reimbursing themselves and they must also give the result of their discoveries to others. This is all right in one way, but it has the effect of making every one hold off waiting for some one else to stand the expense of trying out the method."

Record for Unfilled Steel Orders

Number of Tons on Order Exceeds Previous Highest—About Double Normal

NEW YORK CITY, March 10—In its last monthly statement the United States Steel Corporation reports unfilled orders on its books as of Feb. 29 last of 8,568,966 tons. This compares with 7,922,767 tons on Jan. 31, an increase of 646,199 tons, and with 4,345,371 tons on Feb. 28, 1915.

The total of 8,568,966 tons on the books establishes a new high record, and exceeds by 79,248 tons the previous topmark of 8,489,718 tons on Dec. 31, 1906. At that time, however, there was considerable duplication in compiling the orders because of the fact that business taken by one subsidiary which had to depend upon another for part of its supplies, was included for both amounts. This feature has been eliminated, however, and the orders on the books of the corporation at present will exceed those of the previous high mark by a much larger total if it were possible to eliminate the duplications in 1906.

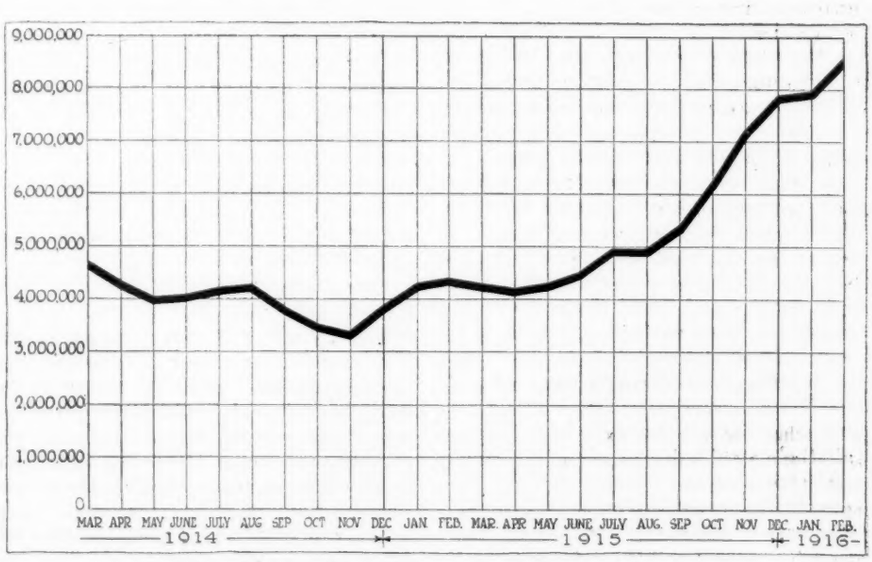
The increase of more than 646,000 tons was larger than had been generally expected. Before the statement was issued the estimates varied from gains of 250,000 to one or two as high as 600,000 tons, but a belief prevailed that the higher figures were too optimistic. It had been generally known that the orders received by the Steel Corporation during February were considerably above those of the previous month, and also that the officials of the company were more discriminatory in accepting business than ever before in the history of the concern.

That, in view of these conditions, such a large increase was recorded was, therefore, considered remarkable. The fact that the present bookings are all firm orders and not contracts against which specifications have been made, therefore allowing cancellations, also is significant.

During February the Corporation established more than one record. It is believed that never before since its organization has the company been booked so far ahead. A considerable tonnage apparently was taken to be filled during 1917. It has been known that some subsidiaries had sufficient orders on hand to keep them operating at capacity during the remainder of 1916, and in view of this fact it can be expected that further business for next year's delivery will be taken during March.

So far this month the orders received compare favorably with those of February, it is unofficially stated. The buying by railroads, while not taking the first position so far as steel consumption is concerned, is receiving the bulk of the attention of the steel makers. When it is recalled that the carriers have placed orders for delivery in the first quarter of 1917 for more than 125,000 tons of rails, it can be seen that a large amount of business can still be expected from this source.

Excellent net earnings of the Steel Corporation for the remainder of 1916 are now practically assured. Estimates ranging to as high as $280,000,000 for the entire year are being made, but these, it must be admitted, are merely guesses. No one can forecast as early as this what the Corporation will show at the end of the fourth quarter, but it seems fairly safe to say that with the large amount of business on hand and the probability of further advances in the prices of various products, the Steel Corporation will establish new records in the succeeding quarters of 1916.



Variation in Unfilled Steel Orders (Tons) During Last Two Years

Mexico Will Be Good Market

Good Roads Planned Throughout Mexico—Trade Expansion Will Demand Trucks

LAREDO, TEX., March 10—The automobile, tire and accessory business in Mexico shows indications of a marked revival, according to information received here from reliable sources. When business fully opens up it is expected that an unprecedented demand for automobiles, motor trucks and delivery cars of American manufacture will be mainifested. The trade in tires and accessories has already reached considerable volume, and it is increasing gradually. Dealers in Laredo expect to get their full share of this Mexican business, along with the automobile and accessory concerns of Eagle Pass, Brownsville, El Paso and San Antonio.

Five Years Closed

It is practically five years since Mexico was eliminated as a market for automobiles and other motor vehicles. At the time the revolutionary period in that country was inaugurated practically all of the leading automobile manufacturers of the United States were represented by agencies in the City of Mexico, Monterey, Aguas Calientes, Vera Cruz and other of the larger cities of the republic. Garages and dealers were located in all of the principal cities, and large stocks of tires and accessories were carried. In those days the trend of the demand was for the higher priced French cars, and in the City of Mexico more automobiles of French make were to be seen upon the streets than of American manufacture. A very large part of the tires and accessories came from France, Germany and England.

While there has been some replenishing of automobiles in Mexico during the last few years, and particularly during the past few months, it is still a virgin field for this class of trade. Most of the cars that have been shipped to Mexico from Laredo and other border towns recently were for military uses and to replace the old, worn-out motor vehicles that saw hard service during the revolutionary period. The demand now extends to private customers to a large degree. In this connection it may be well to mention that the prevailing idea in the United States seems to be that the people of Mexico have exhausted or lost all their wealth by reason of the trials and tribulations through which their country has passed. This is an erroneous impression. While it is true that many men there have had their fortunes badly depleted, there is still much actual cash in the country and it is being placed in circulation as political conditions continue to show improvement.

In the matter of being in a position to quickly supply the needs of the Mexican trade for cars, tires and accessories, the dealers of the towns of Laredo, Eagle Pass and El Paso through these open gateways have a distinct advantage over possible competitors in towns farther removed from the border, it is claimed. As a usual thing the buyer in Mexico wants quick delivery. Not long ago the Laredo Auto Sales Company filled one order for two carloads of tires and tubes for delivery to Yberra & Co., a commission brokerage concern in the City of Mexico, which amounted in value to $25,000 gold.

It is stated by dealers here and at Laredo that there is a good demand for second-hand automobiles for shipment to Mexico. The fact that that country is now short of good horses, and that many people have no means of getting about in carriages, as formerly, is one of the elements that enter into the growing demand for automobiles.

All automobiles and other motor vehicles, as well as tires and accessories, which are sold by dealers here and at other border points are paid for in cash or New York exchange before the shipments are sent across the Rio Grande.

During the last few weeks agencies for the sale of American automobiles have been established in Monterey, Torreon, San Luis Potosi, Tampico, City of Mexico and a number of other larger cities of Mexico. Quite a number of garages have also opened.

Large Trucks Ordered

Some of the larger mining companies and industrial concerns operating in Mexico have placed orders recently for a number of large trucks, and some of these shipments have already gone forward. It is believed that the sale of motor trucks in that country will reach big proportions, inasmuch as they are known to be specially adapted to the heavy hauling which is required in the mining camps and manufacturing centers.

The Mexican duty on automobiles is 66 cents gold each for the first 250 kilos of 2 1/5 lb. each, 55 cents for each of the next 500 kilos, and 45 cents for each of the remaining kilos.

It is said here that it is the plan of "First Chief" Venustiano Carranza and his de facto government to inaugurate an energetic and extensive campaign for the construction of good highways in various parts of Mexico as a part of the general plan of his administration for public improvements. Besides giving employment to many men of the poorer class, the building of roads will be the direct means of bringing about the development of the country.

Colorado Shales Rich in Oil

May Soon Be Worth the Cost to Extract Oil by Distillation

WASHINGTON, D. C., March 13—In view of the ever-increasing demand for gasoline and the increase in price of crude oil, it is important to know, according to a report made public to-day by the United States Geological Survey, that an almost inexhaustible supply of oil may be obtained from the shale of northwestern Colorado, northeastern Utah and southwestern Wyoming. This shale contains materials which, when heated, may be converted into crude oil, gas and ammonia. The high cost of distilling oil from shale as compared to the cost of producing oil from wells has thus far prevented the development in this country of such an industry and may continue to prevent it for some time, but sooner or later this great source of supply will be utilized to supplement the decreasing production from the regular oil fields.

According to the Geological Survey report, the oil derived from the shale is similar to that which is being produced from wells in the United States at the rate of more than 250,000,000 barrels a year. When refined by ordinary methods the shale oil yields an average of about 10 per cent gasoline, 35 per cent kerosene and a large amount of paraffin. The yield of gasoline from the shale may probably be largely increased by the use of refining methods especially designed for that purpose. The gas, which is a very good illuminating gas, will perhaps be sufficient to furnish all the heat required to distill the crude oil from the shale.

The ammonia is a most valuable by-product of the distillation and may be utilized in the manufacture of commercial fertilizer or other nitrogen compounds, as the market demands. The United States Geological Survey has examined large areas of the shale in Colorado, Utah and Wyoming, and has made many distillation tests. Some beds of shale that are several feet thick will yield more than a barrel of oil to the ton of shale, and one bed 6 in. thick will yield more than two barrels of crude oil to the ton of shale. One ton of this shale should therefore yield nearly 10 gal. of gasoline by the present commercial methods of gasoline extraction, and larger yields may be made possible by new methods.

Little attention has been paid to this shale, because the quantity of petroleum produced from wells in the United States has been sufficient to satisfy all de-

mands; but for more than fifty years the oil shale industry of Scotland has been a very important one. In a recent year more than 8000 men were employed in the industry in that country, yet the average yield of oil per ton of shale was much less than that which appears possible from the shale of Colorado and Utah. It is estimated that in Colorado alone there is sufficient shale, in beds 3 ft. or more thick and richer than the shale being mined in Scotland, to yield 20,000,000,000 barrels of crude oil, from which at least 2,000,000,000 barrels of gasoline may be extracted by ordinary refining processes.

As was stated in the recent reply of Secretary Lane to a Senate resolution on the subject of gasoline: "The development of this enormous reserve simply awaits the time when the price of gasoline or the demand for other distillation products warrants the utilization of this substitute source. This may happen in the future. At all events these shales are likely to be drawn upon long before the exhaustion of the petroleum fields."

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Gold Paint for Automobiles

LOS ANGELES, CAL., March 11—When Mr. F. E. Runner, who recently arrived in Los Angeles from Billings, Mont., ordered a Franklin car last summer, he gave instructions that it be painted a gold color, his idea being that that was the best color to disguise the tint of Montana dust. Experience during the past few months has demonstrated the soundness of his idea, and many of his friends have since had their cars painted the same unique color.

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Canadian Dealers May Join American Assn.

CHICAGO, ILL., March 9—At a meeting of the board of directors of the National Automobile Trade Assn., Feb. 26, held at the headquarters, 208 South La Salle Street, Chicago, it was voted to allow the garagemen and dealers of the Dominion of Canada to become members. This action was taken as a result of many requests from Montreal, Toronto, St. Johns and Hamilton.

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Kankakee Co. to Make Six-Cylinder Car

KANKAKEE, ILL., March 12—Chiniquoy Brothers and Parker, is the name of a new firm just organized in Kankakee, which will market a six-cylinder, five-passenger automobile with standard parts, the latter to be assembled in Kankakee and put together with certain parts to be manufactured in that city. The company has been corresponding with manufacturers of engines and other supplies and contracts are now being written sufficient to cover a good-sized output.

Texas Farmers Plant Peanuts

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Poor Wheat Crop Offset by Other Activities—Agriculture in Good Financial Condition

AUSTIN, TEX., March 12—Notwithstanding the fact that the crop-growing season, which is now fairly opened in a large area of the State, is not as promising as the farmers would desire, due to a lack of rainfall in central and south Texas, the demand for automobiles in the agricultural districts keeps up remarkably well. In some of the towns dealers are far behind in filling orders.

Preparations are going forward for planting a big increase of acreage of cotton over that of last year. It is estimated that this increase will amount to fully 15 per cent. The winter oats and wheat came through the cold weather months in such bad shape that thousands of acres of these crops have been plowed up and the land prepared for planting in cotton. Farmers are not paying much attention to the advice of bankers and others that they reduce their cotton acreage this year. The high prices that were obtained from last season's crop are an alluring inducement to engage in the industry to the full limit.

Peanut Industry Booming

The peanut industry has suddenly sprang into much prominence in Texas. It will take rank this year as one of the standard crops of the State. This is due to the fact that many of the cottonseed-oil mills have installed cold presses for the utilization of the peanuts in the manufacture of oil and cake. In every locality where there is an oil mill the farmers are being encouraged to grow a large acreage of peanuts this year.

The livestock industry continues to be in an exceedingly prosperous condition. In some parts of the ranch territory the range is very dry and an unusually large amount of feeding has had to be done to carry the animals through the winter. Many herds are being fattened on silage. Nearly all of the stockmen now grow enough forage upon their ranches to supply an abundance of foodstuff for their cattle.

Building activities in the different cities and towns of the State are now being carried on upon a larger scale than for several years. This is shown by the building permits that have been issued.

Public improvement bonds, both county and municipal, have a higher market value than ever before known, and this fact is causing a veritable boom in civic improvements of various kinds and the construction of good roads. The installation and improvement of public utility plants is receiving much attention. The development of the electric power field in this State has made wonderful progress during the last several months, and important extensions of the power transmission lines are to be made during the present year.

It is the belief of the banks that the farmers will require less assistance in the way of money advances to grow their crops this year than ever before. For the most part the agricultural element of the State is in splendid financial condition. The good prices that were obtained for cotton, livestock and other products placed the average farmer well to the good. The condition is reflected by the unusually large deposits in the country banks.

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Bill Regulating Jitneys Passed

TRENTON, N. J., March 9—The bill regulating jitneys in this State and introduced as a committee substitute for the Kates bill, also regulating jitneys, has been passed. Opponents of the bill argued that its passage would clear the State of jitneys because the terms of regulation are so onerous. Particular exception was taken to the requirement for indemnifying bonds, though it was subsequently explained that the State jitney organization has already made plans to organize an insurance company to provide bonds for its members.

Governor Fielder signed the amendment to the traffic act of 1915, which gives pedestrians the right of way over vehicles in thickly populated communities and repeals the section of the law providing that any person crossing a street where there is no crosswalk does so at his own risk.

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Gray & Davis Laboratory in Detroit

DETROIT, MICH., March 12—In order to afford maximum co-operation to automobile manufacturers in Detroit and vicinity, Gray & Davis have established an engineering laboratory at 1602 Woodward Avenue, Detroit. In the past, all engineering problems connected with electric starting and lighting have been worked out at the Boston plant, but under the new plan, automobile designers who now use, or are about to adopt Gray & Davis equipment, will have the services of the Detroit laboratory at their disposal.

The laboratory will be under the management of C. M. Tichenor, long associated with Gray & Davis, both as engineer and factory superintendent. Mr. Tichenor will be assisted by capable engineers. A complete line of Gray & Davis systems are part of the laboratory equipment and these units will be available for instant installation on various engines, thus expediting all experimental work on new jobs.

Three New Delage for Speedways

Harry Harkness Now Has Lyons Grand Prix Racing Cars

NEW YORK CITY, March 13—Harry S. Harkness will compete this coming season on the speedways with the three Delage cars which were driven by Duray, Bablot and Guyot in the French Grand Prix at Lyons in 1914. The three cars arrived in New York last week and are now being overhauled and fitted with new bodies. Carl Limberg, who will manage the team, will drive one of the cars. This team ought to be one of the most important competing this year, as the cars have been run in the one race only. The motors are peculiar in that the valves are operated positively in both directions, being closed by the cam as well as opened. In the Grand Prix the Delage cars did not do very well owing to some unfortunate adjustment having been made the night before the race. Bablot held the record for a lap over the Lyons circuit in practice spins previous to the race and it was the general opinion among French sportsmen that the Delage cars were faster than the Peugeot. There is no doubt whatever that if the three cars had shown the same form in the race that they had already exhibited in the previous practice trials that it would have been possible to push the victorious Mercedes very hard indeed.

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Jacksonville Show Pleases Bankers

JACKSONVILLE, FLA., March 10—Florida's first automobile show with thirty-four different makes of cars and trucks, closed to-night in this city. Success marked it from every viewpoint and was in many ways a stimulant for business in the Southeast. The show opened on March 5 and was held in a specially constructed building in Confederate Park, making it the first outdoor automobile show of 1916.

The biggest season in this State for automobile men is predicted by Florida bankers, who are very optimistic. At the present time there are a million tourists in this State and in the local banks alone $25,000,000 is on deposit. Business conditions have improved lately. Though some of the industrial mainstays have been hurt by the war, a general improvement has set in lately. Florida industries consist of turpentine, rosin, phosphates, agriculture and lumber. The first three have been slackened up by the war. Turpentine, however, has picked up lately with its domestic business. The citrus fruit market has been productive and the lumber industry is improving. There is a $1,500,000 potato crop in the State and the tomato crop is in a thriving productive state.

With only 14,000 cars in this State, the show has naturally increased interest in the automobile. Banks are not looking with as much disfavor as they did some time ago on the automobile dealers' paper.

As to the demand in Jacksonville and the surrounding territory, the medium-priced car selling from $800 to $1,500 is most in demand. The local purchasing public is looking for power in its cars due to the heavy sands that must be negotiated. The city is lax on improved streets and in the by-ways leading off the main streets there is sand so difficult to go through that the majority of cars have to shift into low gear.

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Locomobile Wins Carbureter Suit

BRIDGEPORT, CONN., March 11—The United States Circuit Court of Appeals has just handed down a decision which reverses that of the Lower Court, which sustained Joseph N. Parken's suit against the Locomobile Co. of America for infringement of his patents for a carbureter.

The patents declared to be infringed by The Locomobile Co. of America cover the use of auxiliary air valves regulated by two springs successively coming into use to automatically meet the requirements of low speed and high speed and at the same time independently adjustable to meet the needs of special conditions.

The main defense on the part of The Locomobile Co. was that the invention was not one, in fact, that the construction was known and had been used before and that it was a natural development of the carbureter art.

It was shown at the trial that a number of persons were working independently on the problem which the plaintiff claims he first solved and that the ideas, possibly the idea of springs, independently adjusted, which occurred to the makers of automobiles were put into form and tried out not only by the inventors themselves, but were given trials by the general public.

In conclusion, the Court of Appeals maintained that, "The improvement based and dependent on the first patent and which simply consisted in controlling the adjustment from the operator's seat, is lacking in invention. The decree is therefore reversed and the case will be remanded with instructions to dismiss the bill."

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Denby Pres. Detroit Board of Commerce

DETROIT, MICH., March 14—Edwin Denby, treasurer of the Hupp Motor Car Co., and of the Denby Motor Truck Co., was to-day elected president of the Detroit Board of Commerce.

Harroun Building Twelve

Will Try Out Aviation Engine in Racing Car Chassis—250 H.P. Expected

CHICAGO, March 4—Ray Harroun, one time International Speedway champion, has become the owner of the three big Maxwells which have been campaigned for two seasons. These are the predecessors of the smaller Maxwell racing cars now in Indianapolis. Along with the cars themselves, Harroun has acquire the tools, jigs, patterns and so on which will be used in manufacturing his aviation motor.

First of the aviation motors according to Harroun's plans is a 250 hp. engine of twelve cylinders and will make its first appearance in the racing car Harroun is building. In a letter to *Motor Age* Harroun says:

"I have purchased all of the Maxwell race car equipment, including drawings, tools, jigs patterns, and all spare parts on hand, also the three 450 cu. in. racing cars.

"It is my intention to apply this tool equipment, patterns, etc., to the manufacturing of my aviation motor which will be largely along the lines of the racing car motors, with the exception that they will be of the twelve-cylinder variety. The first one will be 250 hp., which is the one I will try out on the free-for-all racing car which I am building.

"I will sell the 450 cars just as soon as I can find customers for the same—these have been recently overhauled and are now in first class shape.

"I am negotiating with parties in California for the purchase of two of these cars and it is quite possible they will be seen at the Corona race."

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Big Lamp Merger Planned

DETROIT, MICH., March 13—While negotiations are pending between the Edmunds & Jones Mfg. Co., automobile lamp makers here; the Canadian Lamp & Stamping Co., Walkerville, Ont., and the Chicago Electrical Mfg. Co., Chicago, with the object of a merger which is to be eventually named the Edmunds & Jones Corp., George E. Edmunds, secretary-treasurer of the Edmunds & Jones Mfg. Co., states that the deal has not yet been completed, and that statements published locally regarding the combine are as yet premature.

Local financial circles have it that a syndicate of New York brokerage houses, consisting of Hornblower & Weeks; White, Weld & Co., and Merrill, Lynch & Co., are offering participation in the

marketing of $1,000,000 in 7 per cent cumulative preferred stock and 40,000 shares of common stock which may go on sale at $40 a share, and which is to constitute the capital stock of the new corporation.

This merger, if consummated, would be one of the largest automobile lamp manufacturing enterprises in the world. The Edmunds & Jones Mfg. Co. has been in business in Detroit since 1904, and is capitalized at $500,000 and has always been one of the best known automobile lamp makers in the industry.

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Stubbs Premier Sales Mgr.

INDIANAPOLIS, IND., March 9—P. S. Stubbs has been appointed sales manager of the Premier Motor Corp., this city. Mr. Stubbs became assistant sales manager of the Knox Automobile Co., Springfield, Mass., in 1906; a year later he joined John N. Willys, serving as sales manager and director of the many enterprises undertaken by Mr. Willys—among them the Overland, Marion and American.

When the Hudson Motors reorganized its personnel in 1910 he joined its sales organization and has been associated in an executive capacity with that company as Eastern manager, assistant sales manager and later as Pacific Coast distributor.

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Goodrich Increases Number of Directors to Eighteen

AKRON, OHIO, March 12—The B. F. Goodrich Co. has declared a regular quarterly dividend of 1 per cent on the common stock, payable May 15 to stock of record May 4.

The following have been elected directors of the company to fill the increased places on the board, and one to fill the vacancy of A. H. Wiggin, resigned: W. O. Rutherford, A. B. Jones, Dr. W. C. Geer, H. E. Joy and H. K. Raymond. This makes the present number of directors eighteen.

At a meeting of the directors, officers of the Goodrich company were re-elected. They are as follows: President, B. F. Work; secretary, C. B. Raymond; treasurer, W. A. Means; and sales manager, H. E. Raymond.

At a special meeting of the stockholders of the company, the authorized preferred issue was reduced from $28,000,000 to $27,300,000.

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3025 Ignition Systems Shipped by Atwater-Kent March 1

PHILADELPHIA, PA., March 11—A shipment of ignition systems, equaling one-half of its entire year's output 5 years ago, and amounting to 3025 systems, was made by the Atwater Kent Mfg. Works, on March 1.

F. T. C. Active for Gasoline Supply

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Commission Speeds Up Inquiry Into Subject—Congress Urged to Action from All Sides

WASHINGTON, D. C., March 14—Federal activities to determine causes for the high price of gasoline and to effect a reduction may be briefly summed up as follows:

Federal Trade Commission making thorough investigation of facts, considering this the most important work before them. The commission will make a report before Congress adjourns.

The Director of Mines states that the Rittman process was offered free to all producers and refused on account of a clause which prevented monopoly.

The Bureau of Mines has issued a bulletin describing the Rittman process to minimize the cost of refining.

Representative Steenerson is drafting a new bill to present to Congress which he says will "prevent the high cost of gasoline."

Sentiment in Congress shows that any measure for relief will be heartily indorsed by members.

Members of Congress are being besieged to take action by letters from all parts of the country.

While it will be impossible for the Federal Trade Commission to take any drastic steps or make any specific report for some weeks, Commissioner Harris said to-day that they were urging all their agents to make as quick and thorough an investigation of all conditions as soon as possible, and that all the men who could possibly be called upon for this work have been sent into the field. He expects that it will be at least six weeks before these agents can return and make their reports.

Congress is ready to take prompt action for relief of the automobile users, for every member of Congress is being besieged by constituents to take action. The manufacturers of motor cars are deeply concerned and say that already their trade is suffering seriously because of the heavy increase in cost of running a car. Some of them have written to members of Congress stating that if the present prices for gasoline are maintained it will ruin their business. In response to these urgings Congress as a whole is prepared to give a friendly ear to any adequate measure for relief.

The collection of statistics concerning the production and use of gasoline is asked for in a bill introduced in the House by Representative Carter of Oklahoma. The bill would authorize the director of the Bureau of Mines to collect and publish the statistics, which should include facts concerning the production of crude petroleum, as well as facts concerning its manufacture into gasoline, and the best obtainable facts concerning the marketing of gasoline.

Ford May Make Gasoline

Henry Ford will get into the fight on the high cost of gasoline. This announcement was made to-day by Congressman Randall of California, who appealed to the manufacturer to aid in promoting processes for the cheaper production of gasoline.

Ford, Randall said, believes the Rittman process, discovered in the United States Bureau of Mines, will result in greatly reduced cost to the consumer. Rittman is now experimenting with another process to produce more gasoline from kerosene, Randall said. Ford in a letter to Randall said: "The solution of the gasoline problem is an urgent matter; if one attempt fails, the quickest way to get a solution will be to commence with another. Although I may not be able to take up the Rittman process at once, in response to the appeal of Congressman Randall, after the present test is completed I may go into it thoroughly."

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Chevrolet Bros. To Race Three Frontenac Cars This Season

DETROIT, MICH., March 12—Louis Chevrolet, having completed experiments with the aluminum engine he made last fall, is now completing three brand new racing cars for competition on the speedways during the present year. The cars will be known as "Frontenacs" and will be driven by Louis, Arthur and Gaston Chevrolet.

It is expected that the first of the three will be ready early in May and will appear first on the Sheepshead Bay speedway. The other two should also put in an appearance at Indianapolis.

Chevrolet is building every part of the cars to his own design from engine to rear axle, and expects to get a minimum of 125 hp. from each motor. Light weight has been an aim, and the completed car is scheduled to turn the scale at not more than 1750 lb.

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Embargo on Hides in South Africa

CAPETOWN, March 14—The exportation of wet or dry salted hides has been prohibited except to the United Kingdom. The shipment of sun-dried hides of light weight is permitted conditionally.

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Royer Wheel Co. Formed

AURORA, IND., March 10—The Royer Wheel Co., Aurora, Ind., has been incorporated with $150,000 capital stock, for the purpose of manufacturing automobile wheels, both for pleasure cars and trucks.

I. A. L. Representatives Indicted

Uniontown Grand Jury Charges Conspiracy and False Pretences—Other Arrests

UNIONTOWN, PA., March 13 — The grand jury has indicted A. C. Bidwell, president of the International Automobile League, Buffalo, N. Y., and two of its representatives, Harry Ames Van Auken and F. A. Chapman on charges of conspiracy and obtaining money under false pretences. Chapman is under arrest here and entered a plea of guilty today. He was placed on parole for two years and released. Van Auken was arrested in Valdosta, Ga., and will be brought here for trial.

The Standard Automobile Garage, this city, charges that Van Auken, exhibiting power of attorney signed by A. C. Bidwell and an Illinois Surety Bond, agreed to furnish an Illinois Surety Bond in the amount the garage would pay for a jobbers' contract issued by the I. A. L. However, upon accepting the contract, which purported to enable the garage to purchase accessories and supplies at from 10 to 33 1/3 per cent of the manufacturers' wholesale price, the bond which was returned was not an Illinois Surety Bond, but a bond of the I. A. L. which was almost an exact imitation of an Illinois Surety Bond in appearance and phraseology.

An investigation by the garage proved, it states, that the League has no contracts with manufacturers of standard supplies and accessories. The League denied Van Auken's authority to promise that it would furnish tires, accessories, etc., at the discounts he promised, in spite of the power of attorney he carried. It is stated that several other dealers in accessories and supplies in this vicinity were also induced to sign contracts.

Blames the League

Richard H. Lee, chairman of the A. A. A. legislative board and president of the Cleveland, Ohio, Automobile Club states in the *Ohio Motorist*, the club organ:

"Owing to the great number of individuals throughout the United States who have at one time or another contributed to the International Automobile League, Inc., of Buffalo, N. Y., considerable interest will be displayed in developments at St. John, New Brunswick, Canada, where two agents of the International named Harold Cottrell and Roy Grey, are under arrest charged with receiving money under false pretences.

"The attorney general, upon the opening of court, moved to have the prisoners, who were represented by counsel, immediately enter a plea of guilty. They were not prosecuted on the other ten counts charged against them. The judge suspended the passing of any sentence and let the prisoners go on a recognizance of $1,000 each and warned them that they must refrain from acting as agents of the International Automobile League.

"The attorney general stated that he felt justified in taking this course in suspending the sentence, in view of the fact that the public welfare would be sufficiently served by preventing the operation of the International Automobile League of Buffalo in this territory; that although the prisoners had made improper and untrue representations, they were to a certain extent victims of the system pursued by the parent company at Buffalo for the purpose of getting money from the public without intention to give an honest return for it."

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Brookfield, Rock Falls President

STERLING, ILL., March 12—Galt Brookfield was elected president of the Rock Falls Manufacturing Co., this city at a meeting of the board of directors this week, succeeding C. R. Hardy, resigned. The new president has been connected with the sales department for many years, and is the son of the founder of the company. This concern has been engaged for a number of years in the manufacture of motor hearses, motor ambulances and other motor vehicles.

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S. A. E. Sections Have Busy Week

NEW YORK CITY, March 14—Detroit and Cleveland sections of the S. A. E. both expect to hold big meetings this week. J. G. Perrin will discourse to the Detroiters on the past, present and future of rear axles, tracing the problems appertaining to them and paving the way for an active discussion. In Cleveland, C. F. Kettering will read a paper on the Chemistry of Combustion. Mr. Perrin is particularly adapted to handle his subject, having had so great an experience in the industry, culminating in the chief engineership of the Timken Detroit Axle Co. Mr. Kettering is equally a master of his subject, which has a distinct bearing upon the problems of an ignition expert. The Detroit meeting takes place to-night, and that in Cleveland is on Friday, March 17.

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Chalmers February Shipments Total $3,000,000

DETROIT, March 12—During February the Chalmers Motor Co., shipped $3,000,000 worth of Chalmers. The biggest day was Feb. 29, when 193 cars were shipped. The number of orders carried over from February is 1747 and besides these there are now 4148 cars ordered for delivery in March. Indications are that April and May will be two record-breaking months for the company.

S. A. E. Discusses Gasoline

Metropolitan Section Expects Big Meeting—Dr. Rittman to Speak

NEW YORK CITY, March 14—At the meeting of the Metropolitan Section of the Society of Automobile Engineers to be held Thursday, March 16, at 8 p. m., at the Automobile Club of America, this city, the topic for discussion will be fuel. E. S. Foljambe, who has studied the subject for a number of years, is presenting a comprehensive paper on this topic.

Dr. Rittman of the U. S. Bureau of Mines, and W. A. Williams, chief petroleum technologist for the government have already signified their intention of being present, and a large attendance is expected in view of the pertinence of the subject.

Before the meeting there will be an informal dinner at which President Russell Huff of the S. A. E. and the council of the society will be the guests of the Metropolitan Section. The students from the neighboring universities have been invited, as have also members of the Motor Truck Club, Electric Vehicle Assn. and Automobile Dealers' Assn. The dinner will start at 6.30 p. m.

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White for Detroit Section Chair

DETROIT, MICH., March 9—The annual election of officers of the Detroit Section of the Society of Automobile Engineers is scheduled for April 17. The nominating committee has prepared the following slate of officers for the coming administrative year: For section chairman, D. McCall White; vice-chairman, W. A. Brush; treasurer, J. G. Heaslet; secretary, B. G. Koether; for member of the national nominating committee, K. W. Zimmerschied; members of the nominating committee: S. B. Dusinberre, J. W. Stark and C. M. Hall, the latter as its chairman.

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14,537 Licenses in Alabama

MONTGOMERY, ALA., March 10—The State board of equalization has issued 14,537 licenses to owners of automobile and motorcycles since the beginning of 1916. Of these, 11,615 were for pleasure cars and 2183 for motor trucks. There are many owners, however, who have failed to obtain new licenses and it is believed the total number of automobiles in the State is well up to 14,500. Jefferson County, of which Birmingham is the capitol, leads in number of machines with 2100 pleasure cars and 635 motor trucks. Montgomery County, in which is Montgomery, has 930 passenger machines and 160 commercial cars, while Mobile County has 912 pleasure cars and 192 of the

other variety. One county is without a truck entirely, according to reports sent in, while the smallest number of machines in a single county is 20.

It is expected that the State will purchase very close to 5000 new cars during 1916. Financial improvement in both industrial and agricultural lines will bring this about. The war has brought prosperity to the Birmingham district, with its big steel mills, and enlargements and improvements have been coming rapidly. Other sections, with coal and iron interests, are feeling the improvement. The rural sections are benefitted by the clarification of the cotton situation and the improved condition of the market in the staple. Better methods of farming, likewise, are resulting in more profits for the farmers; road improvement and the establishment of national highways crossing the State are also factors in the growth of the automobile industry, and dealers in cars and accessories throughout the State are expecting a good year.

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Half Total Rubber Used for Tires

WASHINGTON, D. C., March 13—The census bureau has issued a preliminary statement of the general results of the 1914 census of manufacturers with reference to the rubber industry. It shows, among other things, that the production of rubber tires for 1914 was valued at $146,411,692 and formed almost half, 48.8 per cent, of the total value of all kinds of rubber goods manufactured during the year. Statistics for the manufacture of tires were not obtained for 1909, but it may be safely assumed that the increase of 52.1 per cent in the total annual output of rubber goods during the 5-year period is accounted for in very large part by the enormous growth of this branch of the industry.

There was reported the manufacture of 8,020,815 automobile tires or casings, valued at $105,671,223; of 7,906,993 inner tubes, valued at $20,098,936; of solid tires for motor and other vehicles to the value of $13,735,681, and 3,728,138 motorcycle, bicycle and aeroplane tires, valued at $6,905,852.

Record Shipments in Feb.

21,502 Carloads of Automobiles Sent—Almost 100% Better than Feb. 1915

NEW YORK CITY, March 11—Record-breaking shipments of automobiles continued during February, when 21,502 carloads of automobiles were shipped. This is the biggest month in the history of the industry and almost 100 per cent better than February, 1915, when 11,973 carloads were shipped.

On account of the freight shortage, more than 1500 carloads were shipped on open cars covered with tarpaulins or in ordinary box cars by partly disassembling the automobiles, including the removal of mudguards.

It was expected that the larger part of 10,000 new railroad cars would be in service by this time to care for the increased production, but because of the inability of car builders to secure materials only 1200 of them have been put into service, making the total equipment of the railroads about 60,000 automobile cars.

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Gramm Gets Big British Order

LIMA, OHIO, March 9—The Gramm-Bernstein Co. has closed a $1,225,000 order for trucks said to be for commercial purposes in Great Britain.

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Steel Prices Higher

NEW YORK CITY, March 14—Material prices continue to soar. With few exceptions prices are being maintained at the high level established during the past few weeks. Rubber seems to be the only product which is at the present time quoting around normal prices. The metals, however, are continuing on their skyward ascent. Both Bessemer and open-hearth steel prices are now double what they were before the start of the war. Aluminum and lead have taken another jump, and tin has established a new high mark by rising to $6 per 100 lb.

Though the price of gasoline remained constant last week a rise of significance occurred in crude oil from Kansas, which jumped to $1.45 a barrel with a net gain of 15 cents.

Last week aluminum rose 5 cents a lb., to 65, establishing a new high mark. Lead, which has been on the ascendency during the past month, again rose, reaching $6.85 per 100 lb. Bessemer steel, after a rise of $2 per ton the previous week, went up $3 more in price, establishing a record mark of $40. Open-hearth steel also rose to $40, the previous price being $38. Copper prices remained unchanged, the market being dull, with little business being done. The scarcity of tin has caused a further rise in quotations. This metal is now quoting at $55 per 100 lb. Though there is an active demand for spot tin, the scarcity of the product has been the cause for very little business being done.

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Large Increase in N. J. Licenses

NEWARK, N. J., March 9—Registrations in New Jersey during the first two months have shown a large increase over the same period in 1915. To February 29, the collections of the Department of Motor Vehicles amounted to $726,633.26, as compared with $526,613.83 in the same period in 1915, an increase of over $200,000.

During this period the department has registered 56,012 cars, and 114 trailers. Drivers' licenses numbered 66,983; and transfers recorded were 862.

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Australian Shipping Costs High

NEW YORK CITY, March 11—The American automobile manufacturer is now not only confronting a shipping problem by rail in this country, but one on his exports also. In line with his desire to open up trade in China, Australia and other countries, he must now pay the shipping companies high rates on account of few ships and lack of space. Just before the war rates to Australia were running from 25 to 30 cents a cubic foot. Now the shipping companies demand $1 per cubic foot. This means at this rate every one of the automobiles going to that country would cost for ocean freight alone approximately $400.

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California Co. May Use Rittmann Process

LOS ANGELES, CAL., March 10—The first California company to apply to the government for permission to use the Rittmann process of refining gasoline is the Independent Oil Producers' Agency, of which L. P. St. Clair is the president. At present the agency members are producing large quantities of low gravity crude oil, which under the refining methods now employed yields very little gasoline. With the Rittmann proc-

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thur.	Fri.	Sat.	Mon.	Week's Ch'ge
Aluminum	.60	.64	.64	.64	.58	.65	+ .05
Antimony	.44	.44	.44	.44	.44	.44	...
Beams and Channels, 100 lb	2.42	2.42	2.42	2.42	2.42	2.42	...
Bessemer Steel, ton	37.00	37.00	40.00	40.00	40.00	40.00	+3.00
Copper, Elec., lb	.27½	.27½	.27½	.27½	.27½	.27½	...
Copper, Lake, lb	.27½	.27½	.27½	.27½	.27½	.27½	...
Cottonseed Oil, bbl	10.25	10.28	10.46	10.49	10.42	10.45	+ .20
Fish Oil, Menhaden, Brown	.53	.53	.53	.53	.53	.53	...
Gasoline, Auto, bbl	.24	.24	.24	.24	.24	.24	...
Lard Oil, prime	.95	.95	.95	.95	.95	.95	...
Lead, 100 lb	6.70	6.90	6.90	6.90	7.10	6.85	+ .15
Linseed Oil	.78	.78	.78	.78	.78	.78	...
Open-Hearth Steel, ton	38.00	38.00	40.00	40.00	40.00	40.00	+2.00
Petroleum, bbl., Kansas, crude	1.30	1.30	1.40	1.40	1.45	1.45	+ .15
Petroleum, bbl., Pennsylvania, crude	2.50	2.50	2.50	2.50	2.50	2.50	...
Rapeseed Oil, refined	1.05	1.05	1.05	1.05	1.05	1.05	...
Rubber, Fine Up-River, Para	.77	.78	.77	.77	.76	.76½	— .00½
Rubber, Ceylon First Latex	.94	.93	.94	.94	.93	.93	— .01
Sulphuric Acid, 60 Baume	2.00	2.00	2.00	2.00	2.00	2.00	...
Tin, 100 lb	49.00	49.50	51.00	55.00	55.00	55.00	+6.00
Tire Scrap	.06½	.06½	.06½	.06½	.06½	.06½	...

ess it is believed that a yield of motor spirits equivalent to gasoline, running as high as 60 per cent, may be obtained from the crude oil. The actual cost of producing the gasoline is estimated at 1 cent a gallon, exclusive of the cost of the oil from which it is extracted; and the officials of the Independent Agency confidently expect that they will be able to retail gasoline in California for less than 10 cents a gallon.

It is understood that the Rittmann process is to be held by the government solely for the benefit of the public, and that any improvements that may be made by companies which install the process eventually will become the property of the government. At the present time, however, refiners who make improvements will not be asked to share their secrets with their competitors, although all companies which adopt the process will be given the benefit of the knowledge now possessed by the federal officials.

The Independent Oil Producers' Agency will begin work at once upon their plant, and will soon be a competitor for the gasoline trade of California.

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EAST PALESTINE, OHIO, March 9—The McGraw Tire and Rubber Co. has decreased its capital from $1,500,000 to $1,475,000.

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CANTON, OHIO, March 9—The Timken-Detroit Axle Co. has increased its capital from $3,000,000 to $6,000,000.

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ARVADA, COL., March 9—The Dry Climate Tire Mfg. Co., Arvada, has increased its capital stock from $200,000 to $500,000, and is arranging to install additional machinery in its new plant and increase its working force.

Better Tone in Securities

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Mexican Affair Seems to Have No Effect on Quotations—Overland Rises to 228

NEW YORK CITY, March 12—Automobile and accessory security prices last week reversed the usual order of declines manifested during the year, and showed gratifying gains on top of a better market. The annual reports made by several of the companies listing their stocks on the Exchange probably were responsible for the upward tendency. The market is acting better than it has for months and there seems to be a persistent confidence in higher prices eventually. The new phase in the Mexican affairs serves to divert attention from our European negotiations. It is thought that the Mexican trouble will not be regarded as a particular menace to any market betterment.

Overland featured the market with a jump of 12 points, reaching 228, and 10-point rises were recorded by Chalmers, Miller Rubber and Paige. General Motors responded to the turn in prices with a 5-point rise, reaching 465. And Maxwell, Studebaker, Chevrolet, Goodrich, Firestone and U. S. Rubber came to the fore, after a period of declines, with very substantial gains. Chevrolet, especially, showed a gratifying gain of 7 points, after reports of its earnings during the past four and a half months had been reported.

Just what effect the present gasoline investigations will have on the stocks of the oil companies is not as yet known; however, oil stocks for the past two weeks have not been as strong as usual, both Texas and Vacuum issues showing drops during each of the two weeks.

Last week the New York Stock Exchange admitted to the regular list $3,758,200 6-per cent cumulative preferred stock and $3,582,500 common stock of the Kelly-Springfield Tire Co. This company may also add $1,324,700 in common stock on official notice of issuance, making the total amount of common to be listed $4,907,200.

General Motors featured the Detroit Exchange with a rise of 37 points, reaching 462½. Prices in that city showed a higher tendency. Chalmers common rose to 152 at a gain of 13 points.

During February 80,580 shares of stocks were sold on the Detroit Exchange, not including 296 shares of stocks of banks. The biggest sales were those of Reo Motor Car Co. shares, the total which changed hands being 22,400, at from 33⅞ to 39¼ per share. Of the now Continental Motor Co.'s shares at $10, a total of 12,379 were sold, at from 25 to 35¼, while of the old stock at $100, 1085 changed hands at from 292 to 515 a share.

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Dividends Declared

Electric Storage Battery Co.; 1 per cent from net earnings of company on common and preferred, payable April 1 to stock of record on March 21.

Willys-Overland Co.; quarterly of 1¾ per cent on preferred, payable April 1 to stock of record March 21.

Chandler Motor Co.: quarterly of 1½ per cent, payable April 1 to stock of record March 7.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Ajax Rubber Co. (new)	..	..	67	70	—1¼
Aluminum Castings pfd	98	100	..	..	..
J. I. Case pfd	75	80	84	87½	—1
Chalmers Motor Co. com	..	83½	140	160	+10
Chalmers Motor Co. pfd	92	94	98½	100	— ½
Chevrolet Motor Co	..	..	147	149	+7
Electric Storage Battery Co	48½	49½	63	64	+1
Firestone Tire & Rubber Co. com	398	403	745	755	+5
Firestone Tire & Rubber Co. pfd	109	111	113	115	..
General Motors Co. com	95	96½	465	469¾	+5
General Motors Co. pfd	96	96¾	112¾	113¾	— ¼
B. F. Goodrich Co. com	34	35	72½	72¾	+2¼
B. F. Goodrich Co. pfd	97½	99½	116	116½	+2¼
Goodyear Tire & Rubber Co. com	192	194	338	343	—7
Goodyear Tire & Rubber Co. pfd	104½	105½	115	115½	—1
Gray & Davis, Inc., pfd	..	..	98	102	..
International Motor Co. com	..	..	19	23	..
International Motor Co. pfd	..	..	32	38	+2
Kelly-Springfield Tire Co. com	111	112	..	..	..
Kelly-Springfield Tire Co. com. (new)	..	..	69	71	+2
Kelly-Springfield Tire Co. 1st pfd	83	85	95	97	..
Kelly-Springfield Tire Co. 2d pfd	118	125	..	..	..
Maxwell Motor Co. com	30¾	31¼	60	60½	+1
Maxwell Motor Co. 1st pfd	73½	73½	83	84	+ ¾
Maxwell Motor Co. 2d pfd	30¼	30½	45½	46	+1½
Miller Rubber Co. com	163	170	235	240	+10
Miller Rubber Co. pfd	101	103	112	115	+1½
New Departure Mfg. Co. com	125	126	172	175	+1
New Departure Mfg. Co. pfd	105½	108	111	..	+1
Packard Motor Car Co. com	..	97½	170	185	..
Packard Motor Car Co. pfd	93½	97½	102	‡104	..
Paige-Detroit Motor Car	..	..	675	700	+10
Peerless Motor & Truck Corp	..	..	27¾	28½	+ ¾
Portage Rubber Co. com	34	36	70	72	+2
Portage Rubber Co. pfd	85	95	106	107	..
Regal Motor Co. pfd	..	..	..	16	..
*Reo Motor Truck Co	11½	12½	24	26	—1
*Reo Motor Car Co	28½	29¼	33	34	..
Splitdorf Electric Co. pfd	..	..	..	..	..

	1915 Bid	1915 Asked	1916 Bid	1916 Asked	Wk's Ch'ge
Stewart-Warner Speed. Corp. com	54½	56	86½	88	+2½
Stewart-Warner Speed. Corp. pfd	101½	..	108½	..	..
Studebaker Corp. com	47	47¾	140	140½	+3½
Studebaker Corp. pfd	93	95	113	113½	+3
Swinehart Tire & Rubber Co	73	75	88	89	..
Texas Co.	131½	132½	191½	192	—8
U. S. Rubber Co. com	55½	56½	51½	52	+2
U. S. Rubber Co. pfd	102½	103	107½	108½	+ ½
Vacuum Oil Co	180	183	220	224	—3
White Motor Co. (new)	..	..	47½	48	+ ½
Willys-Overland Co. com	107½	110	228	233	+12
Willys-Overland Co. pfd	99¾	101½	104	105	..

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

Chalmers Motor Co. com	..	82	152	162	+13
Chalmers Motor Co. pfd	91½	93½	98	101	+ ½
Continental Motor Co. com	170	187½	33½	35	+4
Continental Motor Co. pfd	80	85	9	10	— ½
Ford Motor Co. of Canada	525	..	..	370	—15
General Motors Co. com	95	97	462½	..	+37½
General Motors Co. pfd	96	97	111	114	..
Maxwell Motor Co. com	29	31	59	62	+1¼
Maxwell Motor Co. 1st pfd	72	74	82	86	+1½
Maxwell Motor Co. 2d pfd	28½	30½	44	48	+1½
Packard Motor Car Co. com	..	97½	170	178	+3
Packard Motor Car Co. pfd	93¾	97	..	104	..
Paige-Detroit Motor Car Co	..	..	675	..	..
*Reo Motor Car Co	28½	29½	33	34	..
*Reo Motor Truck Co	11½	12⅛	24¾	25½	— ⅛
Studebaker Corp. com	46	47	140	143	+5¼
Studebaker Corp. pfd	93	95	107	..	..

INACTIVE STOCKS

*Atlas Drop Forge Co	..	25	32¼	40	..
Kelsey Wheel Co	195	..	435	..	..
*W. K. Prudden Co	19	20½	..	33	..
Regal Motor Car Co. pfd	..	25	..	16	..

*Par value $10. ‡Accrued.

Factory Miscellany

Armstrong Spring Co. to Enlarge—An addition, 60 by 260 ft., is to be put up at the plant of the J. R. Armstrong Mfg. Co., Flint, Mich., automobile spring manufacturer.

Continental Motor to Add—The Continental Motor Co., Muskegon, Mich., has been granted permission by the city for the erection of new steel and concrete machine shops, which will be additions to the present sawtooth buildings on Western Avenue and Water Street. Plans have also been made for the erection of a new sand blast.

Jones Motor Co. Buys Plant—The Jones Motor Car Co., Wichita, Kan., has purchased the plant formerly occupied by the Burton Car Works in the North End, Kansas City, Mo., and will move the Jones car factory there as soon as the necessary improvements can be made.

Hayes Truck Adds—The Hayes Motor Truck Wheel Co., St. Johns, Mich., recently installed a new band saw and is now sawing its own logs. Heretofore the company had been using rough planks bought from lumber companies, which now is no longer necessary.

Atlas Drop Forge Completes Addition—The Atlas Drop Forge Co., Lansing, Mich., has completed an addition 40 by 150 ft, for the heat-treating department; also a 70-ft. addition to the steel shed. Foundations are being laid for six new mammoth hammers.

To Make Hubs for Four-Wheel-Drive Cars—E. C. Heimke of the Northern Machine Works, Wausau, Wis., is preparing to undertake a production of a new type of hub for automobiles and trucks with four-wheel drive. Mr. Heimke has been granted patents on the device. He also is the inventor of a portable stone picker, in the form of a light trailer to be attached to vehicles. The picker rakes up and gathers all stones, sticks and other obstructions on highways. The rubbish is conveyed from the road surface into a container.

Hall Secures New Building—The Hall Motor Co. has secured a building at Markham, Ont., and will install equipment for the manufacture of trucks, engines, etc.

New Haven Carriage Adds—The New Haven Carriage Co., New Haven, Conn., builder of automobile bodies, has begun the construction of an addition, 50 by 90 ft., two stories.

Belknap Remodeling Plant—The Belknap Wagon Co., Grand Rapids, Mich., is remodeling its plant and will add to its equipment machinery suitable for the manufacture of automobile bodies.

Buick Adds—The Buick Motor Co., Flint, Mich., is taking bids on the erection of a new heat-treating plant to cost about $9,000.

Truck Plant in Milford—The F. W. Mann Co., Milford, Mass., has bought a one-story building on Central Street and will increase its capacity. This company manufactures trucks.

Hartford Parts Not to Move—The Hartford Automobile Parts Co., Hartford, Conn., has decided not to move to New Britain, as planned, but will retain the old Cheney mill property and operate the New Britain works as a branch. The company plans to increase its capital from $300,000 to $600,000.

Marshall Co. Makes Parts—The Marshall Castings Co., Marshall, Mich., which was organized only a few weeks ago, will specialize in automobile parts. The two first orders which the company has received are from the Buick Motor Co., Flint, and from Dodge Bros., Detroit, and are of a total value estimated at $20,000.

The Automobile Calendar

March 14-17.....Springfield, Ill., Show.
March 15-18.....Trenton, N. J., Show, Armory, under auspices of Chamber of Commerce.
March 15-18.....Newburgh, N. Y., Show, Armory.
March 18-25.....Pittsburgh, Pa., Twelfth Annual Show, Automobile Dealers' Assn., Motor Square Garden.
March 16-19.....Manitowoc, Wis., Show, Orpheum Theatre, F. C. Borcherdt, Jr., Mgr.
March 19.....Los Angeles, Cal., Speedway Race, Ascot Speedway Assn.
March 25.....San Diego, Cal., 50-Mile Automobile Track Race at Fair Grounds.
March 21-25.....Deadwood, S. D., Show, Auditorium. Deadwood Business Club.
March 22-25.....Lexington, Ky., Show, Woodland Auditorium.
March 25-April 1..Wheeling, W. Va., Show, Market Auditorium.
March 27-April 1..Danville, Ill., Show, Eastern Illinois Dealers.
March 27-April 1..Zanesville, Ohio, First Annual Southeastern Show, Airdome.
March 28-April 3..Manchester, N. H., Show, Under Auspices Couture Bros. Academy.
Mar. 29-Apr. 1....Wheeling, W. Va., Show.
April 1-8.....Butte, Mont., Home Industry Electric & Auto Show, Holland Arena, H. W. West, Mgr.
April 3-8.....Twin Falls, Idaho, Show, Oliver Tabernacle, B. H. Fuller, Mgr.
April 8.....Corona, Cal., Race, Citrus Belt Racing Assn.
April 10-15.....Seattle, Wash., Show, Arena.
April 14-16.....Milwaukee, Wis., Garage-Circuit Exposition, Milwaukee Automobile Dealers.
April 15.....Altoona, Pa., Pennsylvania State Motor Federation.
Apr. 26-May 6....Oakland, Cal., First Annual Pacific Coast Motor Power & Automobile Show, Automobile Industries Assn.
May .....Chicago, Ill., Speedway Race for Amateurs, Speedway Park Assn.
May 6.....Sioux City, Ia., Speedway Race, Sioux City Speedway Assn.
May 13.....New York City, Sheepshead Bay Speedway Race.
May 20.....Chicago Non-Professional Speedway Race, Western Interclub, Speedway Park.
May 26-27.....Del Monte, Cal., Meeting, Three Divisions of National Assn. of Automobile Accessory Jobbers.
May 30.....Tacoma, Wash., 100-Mile Speedway Race, Tacoma Speedway Assn.
May 30.....Indianapolis Speedway Race.
May 31.....Minneapolis, Minn., Speedway Race.
June 10.....Chicago Speedway Race. International 300 - Mile Race, Speedway Park, Speedway Park Assn.
June 28.....Des Moines, Iowa, Speedway Race.
July 2-6.....Detroit, Mich., World's Salesmanship Congress, Detroit Board of Commerce Bldg.
July 4.....Tacoma, Wash., Speedway Race, Tacoma Speedway Assn.
July 4.....Coeur D'Alene, Idaho, Race Meet, Hilles-Riegel.
July 4.....Minneapolis 300-Mile Speedway Race.
July 4.....Sioux City Speedway Race.
July 15.....Omaha, Neb., Speedway Race.
July 15.....North Yakima, Wash., Track Race, Riegel-Hiller Co.
Aug. 5.....Tacoma Speedway Race, Tacoma Speedway Assn
Aug. 11-12.....Pikes Peak, Colo., Hill Climb, Pikes Peak Auto Highway Co.
Aug. 12.....Portland, Ore., Track Race, Riegel-Hiller Co.
Aug. 18-19.....Elgin Road Race.
Sept. 4.....Des Moines Speedway Race.
Sept. 4.....Indianapolis Speedway Race.
Sept. 4-5.....Spokane, Wash., Track Race, Inland Auto Assn.
Sept. 11-16.....Milwaukee. Wis., Fall Show, Wisconsin State Fair, Milwaukee Automobile Dealers.
Sept. 16.....Providence Speedway Race.
Sept. 29.....Trenton, N. J., Inter-State Fair, H. P. Murphy, Racing Sec.
Sept. 30.....New York City Sheepshead Bay Race.
Oct. 7.....Omaha Speedway Race.
Oct. 14.....Chicago Speedway Race.
Oct. 19.....Indianapolis, Ind., Race, Indianapolis Motor Speedway.

The Week in the Industry

McFadden Buffalo Firestone Mgr.—H. W. McFadden has succeeded A. L. Manley as manager of the Buffalo branch of the Firestone Tire & Rubber Co. Mr. McFadden was transferred from Dallas, Tex.

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Dealer

Southwest News Items—The Hannon Motor Sales Co., Tulsa, Okla., agent for the Oakland in four of the State's largest counties, has opened a branch salesroom at 616 Okmulgee Avenue, Muskogee.

M. S. Pogue, formerly of San Antonio, Tex., has been named general manager of the Muskogee Overland Co., agent at Muskogee, Okla., for the Overland.

D. D. Davis, Kansas City, Mo., has opened a salesroom at 1922 Grand Avenue, and handles the Scripps-Booth cars in the Kansas City territory.

The Western Auto Supply Co., Tulsa, Okla., has absorbed the Segar Auto Supply Co.

The Joplin Motor Co., Joplin, Mo., has moved into new quarters at 517-520 Joplin Street. The company is distributor for the Studebaker line in six southwestern Missouri counties and two adjoining in Kansas and Oklahoma. A trainload of eighty cars will be received by the company about March 15.

The Chase Motor Truck Co. of Missouri, Kansas City, Mo., has been organized to look after the distribution of the Chase line of trucks in Kansas City. William Wallace is head of the new company and service quarters have been opened at 413-415 Wyandotte Street.

Packard to Build in Pittsburgh—The Packard Motor Car Co., Detroit, has awarded the contract for the construction of a two-story, 100 by 233 ft. service building at Pittsburgh, Pa. The estimated cost is $200,000.

Salt Lake Co. Branches Out—C. L. Evans and A. M. Daly have bought the India Rubber Mfg. Co., 336 South State Street, Salt Lake City, Utah. In the past the company has very largely confined itself to the operation of a vulcanizing plant. The new owners intend to add automobile tires and supplies.

Rex Ignition's New Branch Offices—The Rex Ignition Mfg. Co. has established branch sales offices in Philadelphia and Chicago. F. E. Bruckner is manager of the Chicago branch and William Payne, formerly with the Ferguson Publishing Co., takes charge of the Philadelphia office.

Motor Men in New Roles

Bradner Auto Body V.-P.—H. E. Bradner, since the organization of the Auto Body Co., Lansing, Mich., secretary and general manager of the concern, was, upon his request, relieved of the office of secretary and elected vice-president. He will continue as general manager. As secretary of the company the directors have chosen F. C. Ruch, a stockholder and a well-known insurance man.

Tobin Promoted by Willard—F. D. Tobin, who has been connected with the branch of the Willard Storage Battery Co. in Detroit, has been promoted to assistant district manager of the Detroit territory.

Rippingille Hudson Assistant Mgr.—E. V. Rippingille has been appointed assistant sales manager in charge of service by the Hudson Motor Car Co., Detroit. He has been with the company since its inception.

Greiner Jeffery Secretary—G. W. Greiner, formerly in charge of the credit department of C. T. Jeffery Co., Kenosha, Wis., has been made secretary of that concern.

De Vault Promoted—A. L. De Vault, who was manager of the Detroit branch of the Federal Rubber Co., has been promoted and now has charge of the central district, which comprises the territory of the Detroit, Cleveland, St. Louis and Chicago branches, which have been combined and are now placed under the direct jurisdiction of the Chicago headquarters.

Bloom Rex Sales Mgr.—L. S. Bloom, for years British sales manager of the Rex Ignition Co., has been appointed sales manager of this company in the United States and Canada. Mr. Bloom assumed his new responsibility on March 1, making his headquarters the New York office of this concern.

Whisler Peru Parts Super.—I. S. Whisler has been promoted to the position of superintendent of the Peru Auto Parts Mfg. Co., Peru, Ind.

Williams Chicago Goodyear Mgr.—C. H. Williams has been made manager of the Chicago branch of the Goodyear Tire & Rubber Co., with headquarters at 1601 Michigan Avenue. He was formerly manager of the branch in Portland, Ore.

Duffield with U. S. Rubber—J. E. Duffield has joined the U. S. Rubber Co. interests by becoming sales manager for the Mechanical Rubber Co., Chicago.

De Land with Milwaukee Chalmers—L. S. De Land has been appointed sales representative of Harry Newman, Inc., Milwaukee, distributor of the Chalmers car.

Hoover Leaves Splitdorf—C. A. Hoover has resigned his position with the Splitdorf Electrical Co. to take a Western agency for the Rex Ignition Mfg. Co. He will be located at Kansas City, Mo.

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Dealer

Philadelphia News Item—The branch of the Goodyear Tire & Rubber Co., 207 North Broad Street, Philadelphia, Pa., has increased its business to such an extent that additional quarters have been added at Twenty-fourth and Locust Streets. The new warehouse contains 23,180 ft. of floor space and will accommodate 25,000 tires.

Philadelphia contractors are estimating on the erection of a factory addition to the plant of the Hess-Bright Mfg. Co., maker of ball bearings, at Front Street and Erie Avenue.

The Baker-Price Co., which has handled the KisselKar in this city for some time, has been made sole distributor in this territory for the Westcott.

The interests of F. Winsor Eveland in the Yerkes-Eveland Co., distributor of the Stearns-Knight, have been purchased by President William Yerkes. The latter has plans under consideration for improving the business at 1411-1419 Spring Garden Street.

The Reading-Philadelphia Auto Messenger Co. of Reading has been formed with S. H. Hochfeld as manager. The company, practically the first of its kind in the field, will operate several auto trucks between Reading and Philadelphia.

Opens N. Y. Office—The United Smelting & Aluminum Co., New Haven, Conn., has opened a branch sales office in New York City at 26 Stone Street.

New Supply House in Newark—The Elin Auto Supply Co., 273-275 Halsey Street, Newark, N. J., has just started business. Edward Elin is manager.

U. S. L. Offices Moved—The New England office and service station of the U. S. Light & Heat Corp. have been moved to the Exposition Bldg., Cambridge, Mass., from 25 Irvington Street, Boston. The Detroit office has recently moved from 203 Monroe Avenue to 43-45 Brady Street.